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Revision of *Ceranisus* and the related thrips-attacking entedonine genera (Hymenoptera: Eulophidae) of the world

by

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ABSTRACT

A world revision of the four entedonine (Hymenoptera: Eulophidae: Entedoninae) genera of larval parasitoids of thrips (Thysanoptera) is presented: *Ceranisus* Walker, 1841, *Entedonomphale* Girault, 1915 stat. rev. (reinstated as a valid taxon from previous synonymy under *Ceranisus*, with type species *E. margiscutum* Girault, 1915 stat. rev.), *Goetheana* Girault, 1920, and *Thripobius* Ferrière, 1938. The following new generic synonymies are proposed: *Cryptomphale* Girault, 1917, *Entedonastichus* Girault, 1920, *Pirenoidea* Girault, 1922, and *Thripoctenoides* Erdös, 1954 under *Entedonomphale*. The proposed new combinations are as follows: *Entedonomphale bicolorata* (Ishii, 1933), *E. nubilipennis* (Williams, 1916), and *Thripobius javae* (Girault, 1917) from *Ceranisus*; *Entedonomphale carbonaria* (Erdös, 1954), *E. dei* (Girault, 1922), *E. kaulbarsi* (Yoshimoto, 1981), and *E. mira* (Girault, 1920) from *Entedonastichus*. New synonymies are proposed for the following species: *Ceranisus vinctus* (Gahan, 1932) under *Ceranisus menes* (Walker, 1839), *Diglyphus aculeo* Walker, 1848 under *Ceranisus pacuvius* (Walker, 1838); *Ceranisus maculatus* (Waterston, 1930) and *Thripobius semiluteus* Boucek, 1976 under *Thripobius javae* (Girault, 1917); *Entedonastichus albicoxis* (Szelényi, 1982) under *Entedonomphale carbonaria* (Erdös, 1954), and *Entedonastichus gaussi* (Ferrière, 1958) under *Entedonomphale bicolorata* (Ishii, 1933). Eleven new species are described: *Ceranisus barsoomensis* and *C. votetoda* (Australia), *C. udnamtak* (Nepal); *Entedonomphale boccaccioi* (USA), *E. esenini* (Madagascar), *E. lermontovi* (South Africa), *E. quasimodo* and *E. zakavyka* (Australia); *Goetheana pushkini* (Japan and Republic of Korea) and *G. rabelaisi* (Australia); and *Thripobius melikai* (China). Three species are excluded from *Ceranisus*: *C. ancylae* (Girault, 1917) (mistakenly listed in *Ceranisus*) as well as *C. nigricornis* Motschulsky, 1863 and *C. semitestaceus* Motschulsky, 1863, both taxa incertae sedis. New data are provided on the distribution and host associations of many of the species included in this review.

KEY WORDS: Hymenoptera, Eulophidae, Entedoninae, *Ceranisus*, *Entedonomphale, Goetheana, Thripobius,* taxonomy, host associations, Thysanoptera.

INTRODUCTION

Entedonine parasitoids (Hymenoptera: Chalcidoidea: Eulophidae: Entedoninae) of larval thrips (Thysanoptera) include five genera (Loomans & van Lenteren 1995), one of which, *Pediobius* Walker, is not considered in this review because the great majority of its species parasitise non-thrips hosts. Information on the two thrips-parasitising species of *Pediobius* is available (Loomans & van Lenteren 1995). The known host associations of the other four genera, *Ceranisus*, *Entedonomphale* stat. rev., *Goetheana*, and *Thripobius*, are exclusively with various species of thrips; also morphologically, these four genera (although *Goetheana* only tentatively) seem to form a monophyletic group within Entedoninae (see a cladogram in Schauff 1991). The mandible in all of them is reduced, without teeth.

Earlier lists of eulophid parasitoids of thrips were published by Ferrière (1958), Loomans and van Lenteren (1990), and Loomans (1991); these were followed more recently by the outstanding reviews of thrips parasitoids by Loomans and van Lenteren (1995), Loomans *et al.* (1997), and Loomans (2003). But despite the availability of useful information on the biology and host associations of thrips parasitoid species, their taxonomy has been in flux. As Loomans and van Lenteren (1995: 98) noted, 'The identification of species and genera of this group is greatly hampered because of this and revision of thrips parasitising genera is badly needed', even though a few keys (mostly regional) to separate these four entedonine genera of thrips parasitoids were available at that time (Boucek 1976, 1988; Schauff 1991; Triapitsyn & Headrick 1995). More recently, Triapitsyn and Morse (2005) reviewed the species of *Ceranisus* in the New World. The latest key (Burks 2003) to the genera of Nearctic Entedoninae is available at http://cache.ucr.edu/~heraty/Eulophidae/index.html.

It is reasonable to expect that by using the keys and species descriptions in this taxonomic study, one will be able to identify the majority of specimens within the four above-mentioned entedonine genera worldwide, especially those used in biological control or reared from known thrips hosts. However, several undescribed species of *Ceranisus* from the New World, none of which has any host data, are not included in this review because they were dealt with elsewhere (Triapitsyn & Morse 2005). All of them are known from males only; describing such species at this point would be premature. Discovery of more new species within this group of genera in the future is also quite possible.

When this study was near completion, I learned about the recent paper by Doganlar (2003) with a description of the entedonine genus *Urfacus* Doganlar (type species *U. bozovaensis* Doganlar from Bozova, Sanliurfa, Turkey). Its hosts are unknown but specimens belonging to the type series of *U. bozovaensis* were swept from a wheat field together with many specimens of *Haplothrips tritici* Kurdjumov (Doganlar 2003). Following my request for a loan of the paratypes of *U. bozovaensis*, Dr Doganlar (pers. comm.) determined that its type series consists of two different species: *U. bozovaensis*, represented by males only (described as females) and a *Ceranisus* sp. (a single paratype, described as a male, which I have not seen). Dr Doganlar kindly sent to me two male paratypes (described as females) of *U. bozovaensis* on loan from the Museum of Plant Protection Department, Agriculture Faculty, Mustafa Kemal University, Antakya, Hatay, Turkey. These specimens were mounted individually on cards and labeled as follows: 1. "TR: Sanliurfa, Bozova, 15.VI.02 M. Doganlar"; 2. "*Triticum* sp. field"; 3. (red) "PARATYPE♀ *Urfacus bozovaensis* Dog."; 4. "Paratype ♂". One of these paratypes was then slide-mounted at UCRC, with Dr Doganlar's permission. Based on the examination of the paratypes of *U. bozovaensis* and also the information provided in its original description, it appears that *U. bozovaensis* belongs in the genus *Entedonomphale* (its possible host association with *H. tritici*, which belongs to the thrips family Phlaeothripidae, may be indicative of that as only the species of *Entedonomphale* are known to parasitise members of this family of Tubulifera) but unfortunately, the positive placement of this species in the proper genus cannot be done based solely on the male sex because it could also belong in *Ceranisus*. The male of *U. bozovaensis* has the following morphological features: an angulate (broadly V-shaped) vertexal suture; mandible reduced, without teeth; antenna with scape about 2.9 x as long as wide, a little expanded in its basal 2/3, F1 and F2 subequal, each with a sensillum, clava compact, 3-segmented, with an apical spicula;

pronotum, mesoscutum, scutellum, and axillae with a more or less conspicuous cellulate sculpture, midlobe of mesoscutum with 2 pairs of setae; anterior margin of scutellum straight; marginal vein of forewing thick, notably expanded basally (it is my opinion that this is rather a specific, than generic, type of character); petiole more or less triangular or trapezoidal, about as long as wide (in *Entedonomphale*, the petiole of male is often somewhat shorter than that of female). As shown below in this communication, all these features can be variable within both *Entedonomphale* and *Ceranisus*. Thus, finding a conspecific female would be essential before *Urfacus* could be formally synonymised under either *Entedonomphale* (if female antennal clava of *U. bozovaensis* were solid and lacking an apical spicula) or *Ceranisus* (if its female antennal clava were 2-segmented and having an apical spicula; in that case *U. bozovaensis* would be related to *C. lepidotus* Graham, which also has a conspicuous sculpturing of the mesonotum, although much more pronounced than in *U. bozovaensis*, and a relatively thick, but not basally expanded, marginal vein). Therefore, neither *Urfacus* nor *U. bozovaensis* could be included in this revision; their status remains unclarified. It is clear, however, that *U. bozovaensis* is without any doubt a good species, even though quite likely its current generic placement is incorrect. It can easily be recognised from males of all described species of *Entedonomphale* and *Ceranisus* by the characteristic forewing with an unusually expanded marginal vein, as illustrated by Doganlar (2003).

MATERIAL AND METHODS

Altogether, nearly 700 point- or card-mounted specimens were examined in the course of this study, some of which (more than 200) were then mounted onto microscope slides in Canada balsam to facilitate further examination.

Acronyms for depositories are as follows: ANIC, Australian National Collection of Insects, Canberra, Australian Capital Territory, Australia; BMNH, the Natural History Museum, London, England, UK; CAS, California Academy of Sciences, San Francisco, California, USA; CNCI, Canadian National Collection of Insects, Ottawa, Ontario, Canada; HFES, Dr K. Kamijo collection, Hokkaido Forest Experiment Station, Japan; HNHM, Hungarian Natural History Museum, Budapest, Hungary; MHNG, Muséum d'histoire naturelle, Geneva, Switzerland; MPLA, Museo de La Plata, La Plata, Buenos Aires, Argentina; NMSA, Natal Museum, Pietermaritzburg, KwaZulu-Natal, South Africa; QMBA, Queensland Museum, Brisbane, Queensland, Australia; SANC, South African National Collection of Insects, Plant Protection Research Institute, Pretoria, South Africa; SPLK, Systematic Parasitoid Laboratory, Plant Protection and Soil Conservation Station of Vas County, Köszeg, Hungary; UCDC, Bohart Museum, University of California, Davis, California, USA; UCRC, Entomology Research Museum, University of California, Riverside, California, USA; USNM, National Museum of Natural History, Washington, D.C., USA; ZIN, Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia; ZMUM, Zoological Museum of Moscow State University, Moscow, Russia.

The terminology used mostly follows Gibson (1997). All measurements (as length or length/width) are given in microns (µm). An abbreviation used is: F – antennal funicle segment. New geographical distribution records are marked by an asterisk (*).

TAXONOMY

Key to the thrips-attacking genera of Entedoninae (Eulophidae)

1 Head usually with a more or less distinct suture (straight or angulate) across vertex just behind posterior ocelli; mandible reduced, without teeth; flagellum of female antenna with 2 funicle segments 2

– Head without such vertexal suture; mandible toothed; flagellum of female antenna with 3 funicle segments .... *Pediobius* Walker (not considered in this review)

2(1) Forewing recurved along posterior margin, nearly parallel sided below marginal vein; longest marginal setae much greater than width of forewing (Figs 2, 5) .... *Goetheana* Girault

– Shape of forewing not as above; longest marginal setae at most equal to (usually much less than) width of forewing; or female very rarely brachypterous 3

3(2) Female: antennal clava not segmented; male: flagellum either with 2 funicle segments and a 3-segmented (or rarely entire) clava or with 3 funicle segments and a solid clava; both sexes: petiole at least as long as wide, often notably longer than wide; parasitoids of Phlaeothripidae (Tubulifera) .... *Entedonomphale* Girault, **stat. rev.**

– Female: antennal clava 2- or 3-segmented; male: flagellum with 2 funicle segments and a 3-segmented clava; both sexes: petiole at most as long as wide, usually notably wider than long; parasitoids of Thripidae (Terebrantia) 4

4(3) At least one of the following applies (usually both): head with malar sulcus straight and simple or midlobe of mesoscutum with 2 pairs of setae ... *Ceranisus* Walker

– Both must apply: head with malar sulcus clearly divided ventrally (Y-shaped) and midlobe of mesoscutum at most with 1 pair of setae .... *Thripobius* Ferrière

Genus *Goetheana* Girault, 1920

Goetheana Girault, 1920*a*: 97. Type species: *Goetheana shakespearei* Girault, 1920*a*, by monotypy.

Dasyscapus Gahan, 1927: 26, 27. Type species: *Dasyscapus parvipennis* Gahan, 1927, by monotypy. Synonymised under *Goetheana* by Girault 1930: 4.

Goetheana Girault: Boucek 1988: 734, 735; Schauff 1991: 54; Loomans & van Lenteren 1995: 137–146, 197.

Diagnosis: Body size very small (less than 0.8 mm); complete and straight suture present across vertex just behind posterior ocelli; mandible reduced (without teeth); antennal flagellum (in both sexes) with 2 funicle segments (F1 much smaller than F2, the latter superficially appears to be a part of clava), clava 3-segmented, usually with an apical spicula; scape of male antenna notably swollen in the majority of described species; notauli very narrow but distinct in slide-mounted specimens; midlobe of mesoscutum without setae; forewing recurved along posterior margin, nearly parallel-sided below marginal vein, length of marginal setae exceeds width of forewing; petiole much wider than long; ovipositor very short; male genitalia compact and reduced, lacking digiti or a separate aedeagus (Fig. 3).

Biology: Larval parasitoids of various Thripidae (Terebrantia).

Comments: This distinctive entedonine genus was originally described by Girault (1920*a*) in Mymaridae, apparently due to its peculiar forewing. Because females of the species in this genus are quite similar to each other (although details of forewing chaetotaxy, such as the number and position of rows of setae, may be diagnostic) and no females are known for *G. rabelaisi* sp. n., the key below differentiates their males only.

Key to the species of *Goetheana*, males

1 Scape not swollen (length: width ratio about 4:1) .... *incerta* Annecke
– Scape notably swollen (length: width ratio about 2:1 or less) 2

2(1) Scape extremely swollen (length: width ratio 1.0–1.3:1) .... *shakespearei* Girault
– Scape moderately swollen (length: width ratio 1.6–2.0:1, Figs 1, 6) 3

3(2) Forewing more densely setose behind marginal vein (discal setae larger in number and relatively shorter, Fig. 2) .... **rabelaisi** sp. n.
– Forewing more sparsely setose behind marginal vein (discal setae fewer in number and relatively longer, Fig. 5) .... **pushkini** sp. n.

Goetheana incerta Annecke, 1962

Goetheana incerta Annecke, 1962: 277, 278. (Type locality: Skukuza, Kruger National Park, South Africa)
Goetheana incerta Annecke: Loomans & van Lenteren 1995: 137–141, 197.

Diagnosis: Female very similar to that of *G. shakespearei*; male antenna, illustrated by Annecke (1962), with scape slender (about 4 x as long as wide, not swollen), similar to female's. Therefore slide-mounting is almost always necessary for a successful determination of specimen's sex in *G. incerta*, unlike in all other known species of *Goetheana*, males of which can be easily distinguished from females by a swollen antennal scape in live, alcohol-preserved, or dry-mounted specimens.

Type material: Holotype female, 4 paratype females, allotype and 1 paratype male (Annecke 1962) in the South African National Collection of Insects, Plant Protection Research Institute, Pretoria, South Africa, not examined.

Material examined: SOUTH AFRICA: *KwaZulu-Natal*: 1♀ 1♂, Pietermaritzburg, Hilton, 29°32'30.7"S: 30°18'18.4"E, 1131 m, 27.i–16.ii.2004, M. Mostovski [NMSA, UCRC]. *Mpumalanga*: Nelspruit, 30.iv.1998, P.R. Sounders, 19♀ 7♂ and 6 specimens of an undetermined sex (ex. *Scirtothrips aurantii* on *Caesalpinia pulcherima*) [UCRC].

Distribution: South Africa.

Hosts: *Scirtothrips aurantii* Faure (Grout & Stephen 1995).

Goetheana shakespearei Girault, 1920

Goetheana shakespearei Girault, 1920*a*: 97. (Type locality: Greenhills (near Cairns), Queensland, Australia)
Dasyscapus parvipennis Gahan, 1927: 27, 28, pl. I. Synonymised under *G. shakespearei* by Boucek 1988: 735.
Goetheana parvipennis (Gahan): Girault 1930: 4; Annecke 1962: 274–277.
Dasyscapus thripsivorous Narayanan, Subba Rao & Ramachandra Rao, 1960: 168, 169. Synonymised under *G. shakespearei* by Boucek 1988: 735.
Goetheana thripsivora (Narayanan, Subba Rao & Ramachandra Rao): Husain & Khan 1986: 224.
Goetheana shakespearei Girault: Dahms 1986: 526, 527; Boucek 1988: 735; Viggiani & Nieves-Aldrey 1993: 106, 107; Loomans & van Lenteren 1995: 137–146, 197.

Diagnosis: Good redescriptions and illustrations of this species are available (Annecke 1962 (as *G. parvipennis*); Viggiani & Nieves-Aldrey 1993). Scape of male antenna extremely swollen, 1.0–1.3 x as long as wide.

Holotype: Female [QMBA], detailed label data as indicated by Dahms (1986).

Other material examined: AUSTRALIA: *Northern Territory*: Berrimah BRF, 1.ii.1994, K. Hergestrom, 4♀ 1♂ ("in insectary, collected on *Cucumis sativa* leaves, possibly parasitoid of *Thrips palmi*", Det. I.D. Naumann, 1995) [ANIC]. *Queensland*: 6 km W Chinchilla, 24.iv-9.v.1987, G. Lithgow, 1♀ [QMBA]. Gayndah near Weir, 12.v.2000, C. Freebairn, 1♀ [UCRC]. Mt. Glorious, 14.ii–25.iii.1983, A. Hiller, 1♂ [QMBA]. 28°04.05'S:153°13.67'E, 11.xii.2002, J. George, J. Munro, A. Owen, 2♀ [UCRC]. *Western Australia*: Geraldton, 23.x.1994, M. Steiner, S. Goodwin, 2♀ [ANIC]. DOMINICAN REPUBLIC: Pedernales, Sierra de Bahoruco, "Las Abejas", 1300 m, 17–19.i.1989, L. Masner, 2♀ 1♂ [CNCI]. IVORY COAST: Bouake, xii.1980, P. Cochereau, 1♀. THAILAND: Nakonpathom, parasitised thrips larvae coll. 13.viii.1999, T. Murai, parasitoids em. 26–28.viii.1999 in Okayama, Japan, 2♀ 1♂ [UCRC]. TRINIDAD AND TOBAGO: Trinidad Island, Curepe, Sta. Margarita: 7–14.viii.1977, F.D. Bennett, 1♀; 7.xii.1977, 1♀ [CNCI]. USA: *California*: Riverside Co., Riverside, UCR lab. culture on *Heliothrips haemorrhoidalis* (8♀ 7♂ coll. 30.viii.1983 by M. Badgley [UCRC]; 7♀ 10♂ coll. 14.ii.1985 by N.A. Hessein [UCRC]; no date, 4♀ 5♂ [CNCI, UCRC]) of Bahamas origin (orig. coll. in 1983).

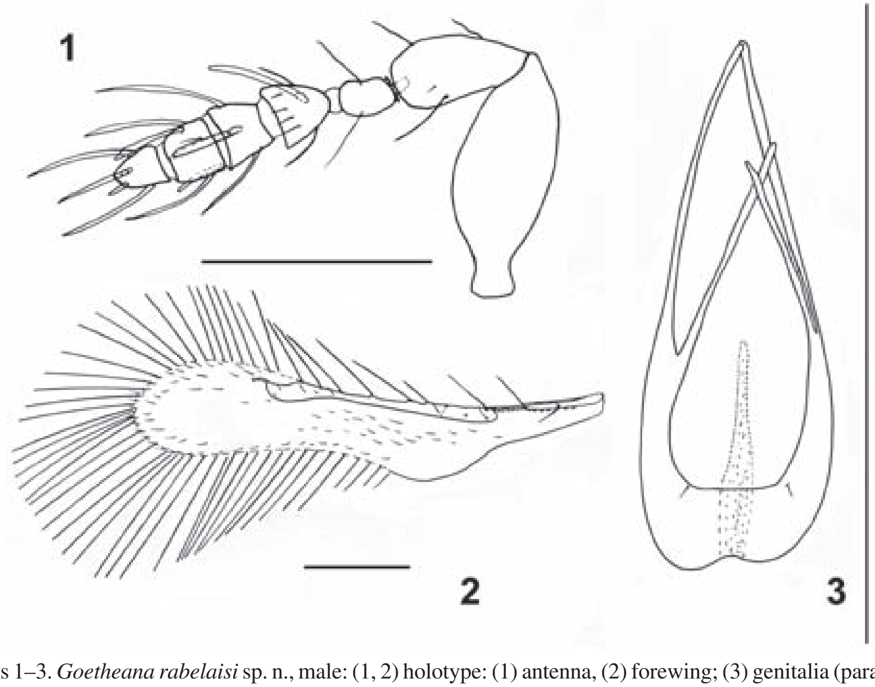
Distribution: Apparently native to the Australasian region; likely also to the Oriental region; introduced to many countries (Hessein & McMurtry 1989; McMurtry *et al*. 1991; Loomans & van Lenteren 1995), sometimes possibly unintentionally (Bennett *et al*. 1993; Kuslitzky 2003).

Hosts: Various Thripidae (Loomans & van Lenteren 1995), including *Ceratothripoides claratris* (Shumsher) (Murai *et al*. 2000).

Goetheana rabelaisi sp. n.

Figs 1–3

Etymology: Continuing A.A. Girault's trend to name some taxa after the great poets and writers of the past (particularly in this genus), I am naming this new species after François Rabelais.



Figs 1–3. *Goetheana rabelaisi* sp. n., male: (1, 2) holotype: (1) antenna, (2) forewing; (3) genitalia (paratype). Scale lines = 0.1 mm.

Diagnosis: Male scape moderately swollen (1.8–2.0 x as long as wide). Forewing with numerous setae behind marginal vein arranged in about 4 irregular rows (Fig. 2), that distinguishes this species from *C. pushkini* sp. n.

Description: Female. Unknown.

Male (holotype and 2 paratypes). Colour (of slide-mounted specimens) of head and mesosoma brown, metasoma yellow or brownish-yellow, appendages light brown.

Antenna (Fig. 1) with scape moderately swollen, 1.8–2.0 x as long as wide; flagellum with F1 longer than wide.

Mesosoma smooth except midlobe of mesoscutum with faint cellulate sculpture. Forewing (Fig. 2) about 5 x as long as wide; longest marginal setae 2.0–2.2 x maximal forewing width; disc slightly infumated and with about 4 irregular rows of setae behind venation, otherwise bare except for a few scattered setae along margins in the broadest part (beyond venation). Hind wing narrow, about 13 x as long as wide; disc bare except for an irregular row of setae along each margin.

Genitalia as in Fig. 3.

Measurements (n=1, holotype): Body: 738. Antenna: scape: 94; pedicel: 55; F1: 21; F2: 28; clava: 62. Forewing: 455/91; longest marginal seta: 191. Hind wing: 394/30; longest marginal seta: 139. Genitalia: 86.

Holotype: Male on slide, labelled: 1. “AUSTRALIA: *Australian Capital Territory*, Canberra, Black Mountain, 9.iv.1995, L. A. Mound, Collector’s code: 2639. On *Exocarpus cupressiformis* in association with *Anaphothrips exocarpi*. Mounted at UCR/ERM by V.V. Berezovskiy 2004 in Canada balsam”; 2. (red) “*Goetheana rabelaisi* S. Triapitsyn HOLOTYPE ♂” [ANIC].

Paratypes: Same data as the holotype, 2♂ on slides [ANIC, UCRC].

Hosts: *Anaphothrips exocarpi* Pitkin (according to the original label).

Comments: The type series of this species was remounted in Canada balsam at UCRC from Hoyer’s medium on a single slide, on which all three specimens had been mounted originally under the same coverslip together with a female of *Stethynium* sp. (Hymenoptera: Mymaridae). The original labels were as follows (now glued onto the bottom of the paratype slide retained at UCRC): 1. “*Exocarpus cupressiformis* in association with *Anaphothrips exocarpi* A.C.T. Canberra Black Mt. 9.iv.1995 LA Mound 2639”; 2. “n. sp.? *Goetheana* (Eulophidae) x 3♂ Mymaridae x 1 = *Stethynium* sp. ♀ Det. S. Triapitsyn 1999 Hoyer’s”. The holotype is in a very good condition but missing one of the hind wings.

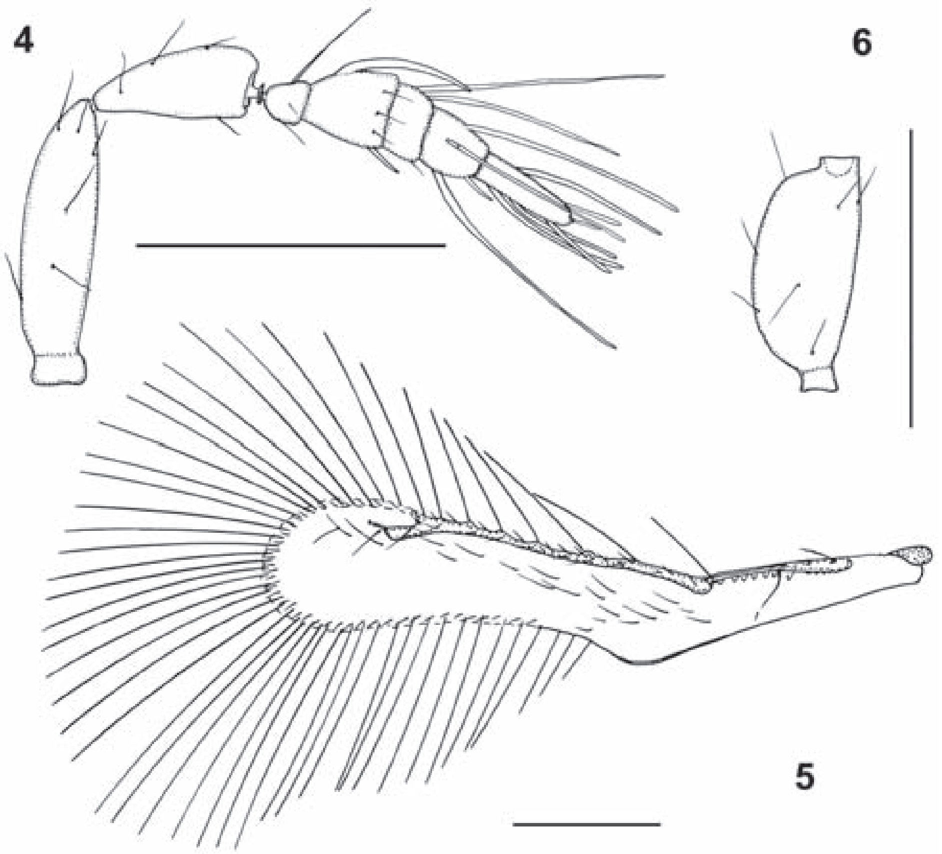
Goetheana pushkini sp. n.

Figs 4–6

?*Goetheana* sp.: Takagi 1988: 331, 332.
?*Goetheana shakespearei* Girault: Loomans & van Lenteren 1995: 141 (?misidentification).

Etymology: This species is named after Aleksandr S. Pushkin.

Diagnosis: The new species superficially resembles *G. shakespearei*, in which the disc of the forewing is more setose in the apical area (beyond venation) in both sexes. In *G. pushkini*, the forewing disc has a few long setae behind marginal vein sparsely arranged in about 2 irregular rows, but the apical area is completely bare except for one row of setae along anterior margin. In addition, female clava is more elongate in the new species (relatively more compact in *G. shakespearei*). Scape of male antenna is moderately swollen (1.6–2.0 x as long as wide), usually slightly more so than in *C. rabelaisi* sp. n., but considerably and consistently less swollen than in *G. shakespearei*.



Figs 4–6. *Goetheana pushkini* sp. n.: (4, 5) female (holotype): (4) antenna, (5) forewing; (6) scape, male (paratype); Seoul National University, Seoudun-dong, Suwon-si, Republic of Korea. Scale lines = 0.1 mm.

Description: Female (holotype and paratype). Colour of head and mesosoma brown to dark brown, metasoma yellow to orange-yellow, appendages pale to light brown.

Antenna (Fig. 4) with scape slender, 3.8–3.9 x as long as wide; F1 very small, subquadrate; F2 a little longer than wide; first claval segment wider than long, second a little longer than wide, third much longer than wide.

Mesosoma about as long as metasoma, almost smooth. Forewing (Fig. 5) about 4.6 x as long as wide; longest marginal setae about 2.2 x maximal forewing width; disc hyaline and with about 2 irregular rows of setae behind venation, otherwise bare except for rows of setae along margins in the broadest part (beyond venation) and several setae just beyond venation. Hind wing about 12 x as long as wide; disc bare except for a row of setae along posterior margin and a few very short setae along anterior margin.

Ovipositor very short, occupying about 1/3 length of gaster, not exserted; ovipositor length/metatibia length ratio about 0.6:1.

Measurements (n=1, holotype). Body: 695. Antenna: scape: 94; pedicel: 52; F1: 14; F2: 27; clava: 75. Forewing: 409/89; longest marginal seta: 197. Hind wing: 355/30; longest marginal seta: 148. Ovipositor: 91.

Male (paratypes). Body length 578–596. Similar to female in every regard except for normal sexually dimorphic features such as the proportions of antennal segments and the genitalia. Antenna with scape only moderately swollen (Fig. 6), 1.6–2.0 x as long as wide (length/width ratio varies quite considerably among the different specimens). Genitalia typical for the genus and resemble those in *G. rabelaisi* (Fig. 3).

Holotype: Female on slide, labelled: 1. "SOUTH KOREA: Suwon-si, Seodun-dong, Seoul National University, 37°N:126°E, 17.ix.2001, J.-W. Kim"; 2. "Mounted at UCR/ERM by V. V. Berezovskiy 2004 in Canada balsam UCRC"; 3. (red) "*Goetheana pushkini* S. Triapitsyn HOLOTYPE ♀ "[UCRC].

Paratypes: JAPAN: *Ibaraki Pref.* (Honshu Island): Tsukuba, 30.viii.1987, "ex. *Pseudodendrothrips mori* on Mulberry", 1♀ 4♂ on points and 5♂ on 3 slides (3♂ on the same slide) [CNCI]. REPUBLIC OF KOREA: same data as the holotype, 1♂ on slide [UCRC].

Hosts: *Pseudodendrothrips mori* (Niwa). It is quite likely that this new taxon is conspecific with the *Goetheana* species reared in Fukuoka, Kyushu Island, Japan, from the same thrips host (Takagi 1988). However, it was identified by Dr J. LaSalle as *G. shakespearei* (Loomans & van Lenteren 1995). I haven't seen the voucher specimens pertaining to Takagi's (1988) study and therefore am unable to confirm that identification.

Comments: The holotype female has one antenna missing; flagellum of the other is mounted detached from the body (under the same coverslip).

Genus *Entedonomphale* Girault, 1915, **stat. rev.**

Entedonomphale Girault, 1915: 216. Type-species: *Entedonomphale margiscutum* Girault, 1915, by original designation. **Stat. rev.** (Synonymised under *Ceranisus* by Boucek 1988: 733).

Cryptomphale Girault, 1917*a*: 2. Type species: *Thripoctenus nubilipennis* Williams, 1916, by original designation. **Syn. n.** (Synonymised under *Ceranisus* by Peck 1963: 117).

Entedonastichus Girault, 1920*b*: 143. Type species: *Entedonastichus mirus* Girault, 1920, by monotypy. **Syn. n.**

Pirenoidea Girault, 1922: 107. Type species: *Pirenoidea dei* Girault, 1922, by monotypy. **Syn. n.** (Synonymised under *Entedonastichus* by Boucek 1988: 733).

Thripoctenoides Erdös, 1954: 345. Type species: *Thripoctenoides carbonarius* Erdös, 1954, by original designation. **Syn. n.** (Synonymised under *Entedonastichus* by Boucek 1988: 733).

Thripoctenoides Erdös: Yoshimoto 1981: 723.

Entedonastichus Girault: Boucek 1988: 732, 733; Schauff 1991: 52; Loomans & van Lenteren 1995: 146–149, 197.

Diagnosis: Body usually brown to dark brown or black; occipital suture usually evident (can be straight or angulate) but sometimes inconspicuous; malar sulcus split ventrally (Y-shaped) in most species, rarely straight; mandible reduced (without teeth); antennal scape (both sexes) often notably expanded in basal half and narrowing distally; female flagellum with 2 funicle segments and a solid clava without an apical spicula; male flagellum either with a 2-segmented funicle and a 3-segmented (or rarely solid) clava or with a 3-segmented funicle and a solid clava, clava of male antenna with or without an apical spicula; notauli indistinct; midlobe of mesoscutum with 1 or 2 pairs of setae; anterior margin of scutellum usually angulate (projecting forward into mesoscutum) but sometimes sinuate or almost straight; forewing broadened beyond submarginal vein, stigmal vein often (but not always) relatively far away from wing's apex; petiole at least as long as wide, often notably longer than wide.

Biology: Larval parasitoids of various Phlaeothripidae (Tubulifera).

Comments: Some other morphological features, such as presence or absence of sculpture on head and mesosoma, relative length of marginal setae to width of the forewing, position of the toruli, etc., have proven to be so variable among the species of *Entedonomphale* that they cannot be considered of diagnostic value at the generic level.

Entedonomphale is the earliest generic name published by Girault (1915) for this characteristic genus. For justification of its removal from the previous synonymy under *Ceranisus*, see comments (below) on its type species, *E. margiscutum*. The type species of the genera *Cryptomphale, Entedonastichus, Pirenoidea,* and *Thripoctenoides* all belong in *Endedonomphale*, hence the generic synonymies proposed herein.

Key to the species of *Entedonomphale*, females

1 Forewing disc completely hyaline, without a dark spot or band 2
– Forewing disc with some pigmentation (a more or less distinct dark spot, cloud, or band present) or female brachypterous 5

2(1) Clava notably shorter than funicle .... **quasimodo** sp. n.
– Clava as long as or longer than funicle 3

3(2) Apex of hind wing broadly rounded; longest marginal setae notably less than maximal width of hind wing (Fig. 12) .... **boccaccioi** sp. n.
– Apex of hind wing pointed or at most narrowly rounded; longest marginal setae at least equal to maximal width of hind wing 4

4(3) F1 notably lighter than F2...................................... *bicolorata* (Ishii) **comb. n.**
– F1 concolorous with F2 .... **esenini** sp. n.

5(1) Brachypterous .... *kaulbarsi* (Yoshimoto) **comb. n.**
– Fully winged 6

6(5) Dark spot on forewing disc reaching wing's apex as a narrow longitudinal band (Fig. 23) ………… .... *mira* (Girault) **comb. n.**
– Forewing disc with dark spot, band, or cloud shaped differently, not reaching wing's apex 7

7(6) F1 and F2 appressed, both markedly wider than long (Fig. 24) ....
.... *dei* (Girault) **comb. n.**
– F1 and F2 not appressed, at least F1 as long as wide or longer than wide 8

8(7) Forewing with longest marginal setae very short, about 1/4 maximal width of forewing (Fig. 27) .... *margiscutum* Girault, **stat. rev.**
– Forewing with longest marginal setae relatively longer, at least 2/5 maximal width of forewing 9

9(8) Body mostly light brown, with some brown .... **lermontovi** sp. n.
Body dark brown to black.. 10

10(9) Forewing disc more or less uniformly infumate behind marginal and stigmal veins (Nearctic) .... *nubilipennis* (Williams) **comb. n.**
– Forewing disc with a distinct dark band behind stigmal and distal half of marginal vein, reaching or almost reaching posterior margin (Palaearctic or Australian) 11

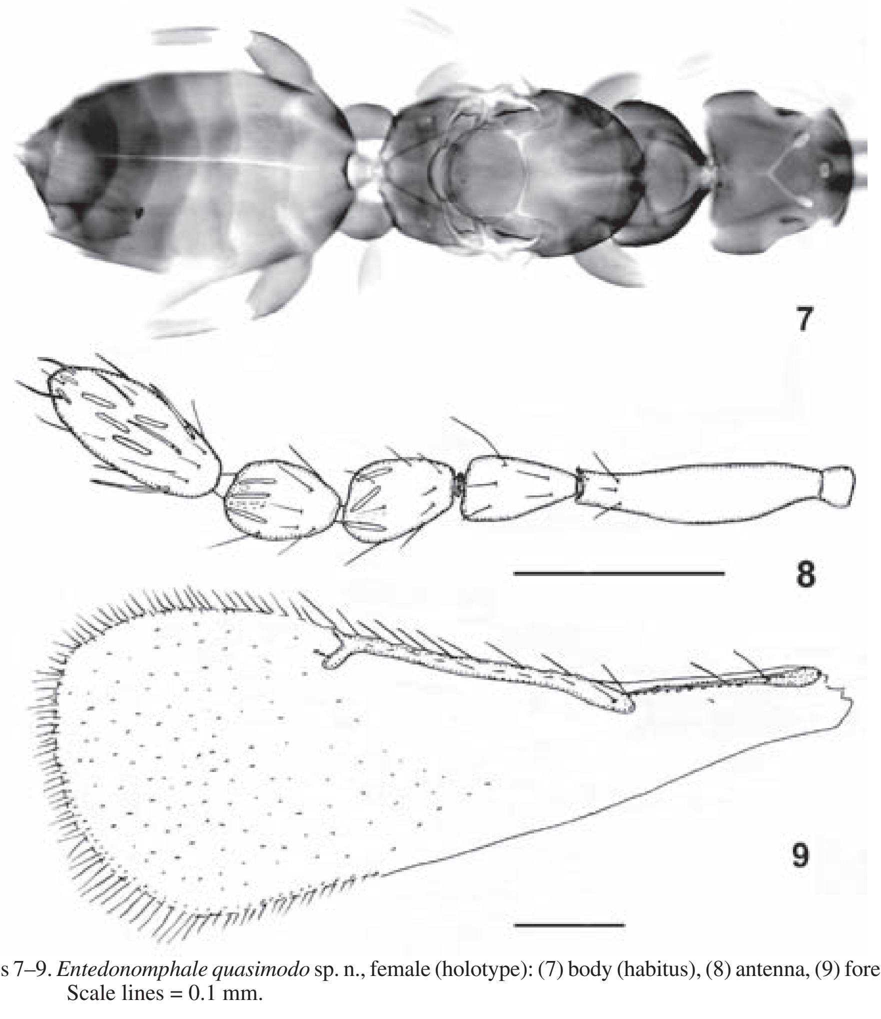
11(10) Palaearctic. [Male antenna with a 3-segmented funicle and a solid clava (Fig. 33)] .... *carbonaria* (Erdös) **comb. n.**
– Australian. [Male antenna with a 2-segmented funicle and a 3-segmented clava]
.... **zakavyka** sp. n.

Entedonomphale quasimodo sp. n.

Figs 7–9

Etymology: The specific name refers to a rather ugly, very unusual habitus of this species (but it is not hunchback at all).

Diagnosis: This distinctive species is so unusual in habitus, that one could assume that it would not fit in any of the described entedonine genera. However, a thorough examination of the slide-mounted holotype specimen proved that this species has all the important morphological features characteristic of *Entedonomphale*. It stands alone among the known species of this genus in having a flattened head and mesosoma, a short clava of the female antenna, very short marginal setae on the wings, and very short legs with notably swollen femora, especially the profemur. These apparently are adaptations related to its peculiar biology as a parasitoid of the gall-inhabiting thrips host.



Figs 7–9. *Entedonomphale quasimodo* sp. n., female (holotype): (7) body (habitus), (8) antenna, (9) forewing, Scale lines = 0.1 mm.

Description: Female (holotype and paratype). Body (Fig. 7) dark brown, almost black, appendages light brown to dark brown.

Head long, compressed dorso-ventrally; vertexal suture distinct and strongly angulate (V-shaped). Antenna (Fig. 8) with scape relatively short, a little expanded in basal 2/3, about 3.0 x as long as wide; pedicel about as long as funicle segments but a little narrower; F1 and F2 subequal, slightly longer than wide (almost as wide as clava), with several sensilla each; clava shorter than funicle, relatively narrow (about 2.5 x as long as wide), with numerous sensilla.

Mesosoma flattened dorso-ventrally, about as long as metasoma, lightly, but notably sculptured. Pronotum large, undivided; no trace of notauli present, midlobe of mesoscutum with 2 pairs of setae; anterior margin of scutellum slightly angulate. Forewing (Fig. 9) about 2.6 x as long as wide; fringe very short for genus (longest marginal setae about 0.17 x maximal forewing width); disc hyaline, more or less evenly setose in apical half of forewing (setae very short and inconspicuous, similar to those in *E. margiscutum*). Hind wing about 6 x as long as wide; disc hyaline, with numerous setae similar to those on forewing; fringe very short (longest marginal setae about 1/2 hind wing width). Legs very short, with femora (particularly profemur) and foretibia swollen, powerful; coxae and femora lightly sculptured.

Petiole conspicuous, trapezoidal, about as long as wide. Ovipositor short, occupying about 2/5 length of gaster, barely exserted; ovipositor length/metatibia length ratio about 1.1:1.

Measurements (n=1, holotype). Body: 1371. Antenna: scape: 121; pedicel: 55; F1: 57; F2: 56; clava: 96. Forewing: 738/285; longest marginal seta: 49. Hind wing: 646/111; longest marginal seta: 61. Ovipositor: 227.

Male. Unknown.

Holotype: Female on slide, labelled: 1. "AUSTRALIA: WA, ca. 180 km S Port Hedland, 22 04.493 S 118 48.198 E"; 2. "19.x.2000, D. Morris, DM530"; 3."within galls of *Kladothrips xiphius* on *Acacia xilophylla*"; 4. "Mounted at UCR/ERM by V. V. Berezovskiy 2004 in Canada balsam. ANIC"; 5. (red) "*Entedonomphale quasimodo* S. Triapitsyn HOLOTYPE ♀ " [ANIC].

Paratype: AUSTRALIA: *Western Australia*: same data as the holotype, 1♀ on card [ANIC].

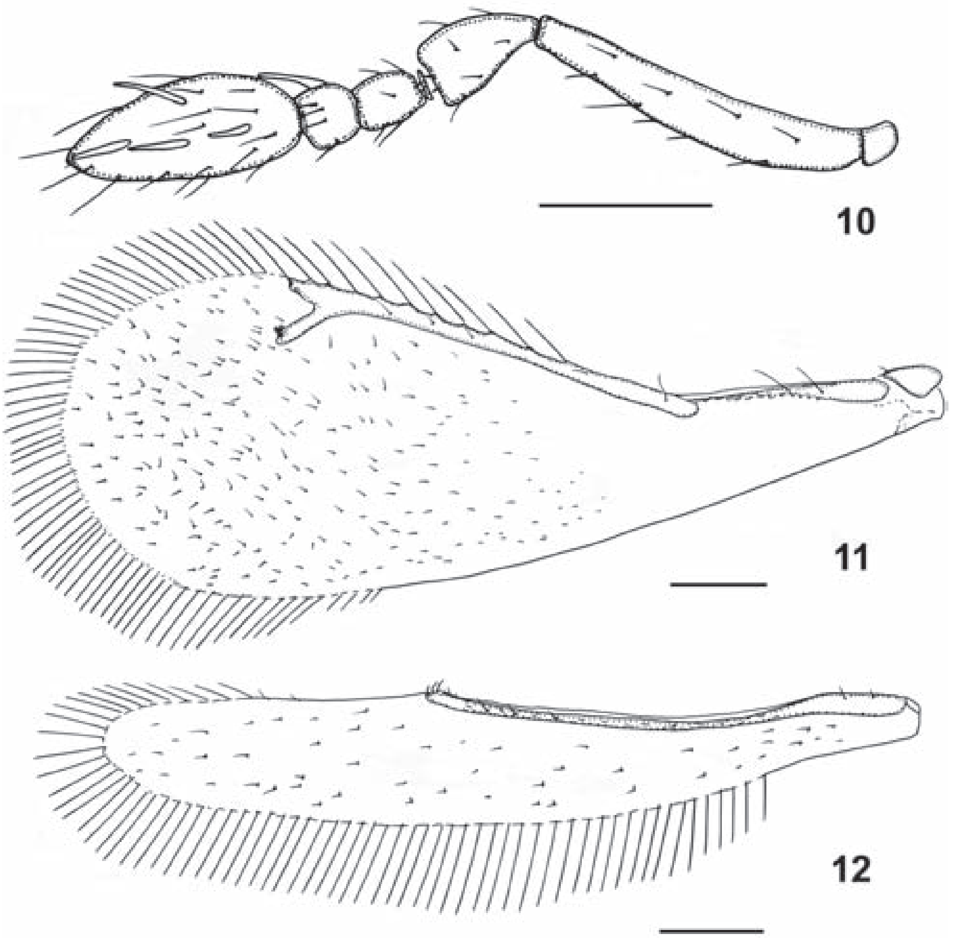
Hosts: Found within the galls of *Kladothrips xiphius* Mound & Crespi (according to the label).

Entedonomphale boccaccioi sp. n.

Figs 10–14

Etymology: This species is named after Giovanni Boccaccio.

Diagnosis: This species is defined based on the unique combination of the following morphological features: male antenna with a 2-segmented funicle and a solid clava (the only species of *Entedonomphale* known to have an undivided clava of the male antenna); female antenna with a slender scape and relatively small funicle segments, their combined length much less than length of clava (F1 without sensilla); both sexes: forewing disc hyaline, with setae very short and inconspicuous, marginal setae short; apex of hind wing broadly rounded. Morphologically, the female of *E. boccaccioi* sp. n. is somewhat similar to the much darker (black) female of another North American species, *E. nubilipennis*, which has a narrower forewing (about 3.0 x as long as wide) with a medial cloud on the disc and relatively longer marginal setae.

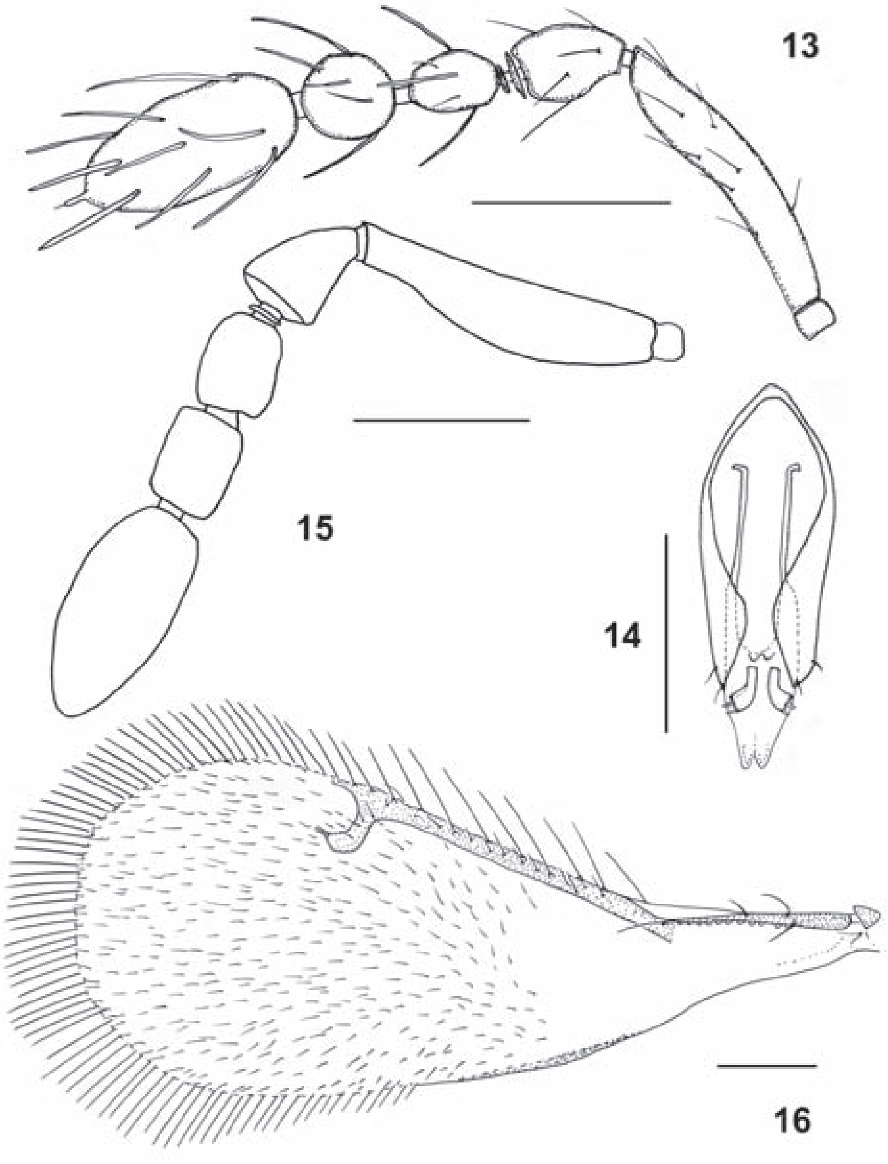


Figs 10–12. *Entedonomphale boccaccioi* sp. n., female (holotype): (10) antenna, (11) forewing, (12) hind wing. Scale lines = 0.1 mm.

Description: Female (holotype and paratype). Body and appendages brown to dark brown except F1 light brown.

Head normal, not compressed dorso-ventrally; vertexal suture faint but distinct. Antenna (Fig. 10) with scape slender, about 3.0 x as long as wide; F1 a little longer than wide and without sensilla, F2 a little wider than long and with 1 sensillum; clava much longer than funicle, about 2.3 x as long as wide, with numerous sensilla.

Mesosoma shorter than metasoma, almost smooth. Midlobe of mesoscutum with 2 pairs of setae; anterior margin of scutellum almost straight. Forewing (Fig. 11) about 2.7 x as long as wide; longest marginal setae about 0.28 x maximal forewing width; disc hyaline, more or less evenly setose in apical half of forewing (setae very short, inconspicuous). Hind wing (Fig. 12) about 6 x as long as wide, with broadly rounded apex; disc relatively wide, with several rows of setae, more or less evenly covered with short, inconspicuous setae; longest marginal setae about 3/4 maximal width of hind wing. Coxae lightly sculptured.



Figs 13, 14. *Entedonomphale boccaccioi* sp. n., male, paratype: (13) antenna, (14) genitalia.
Figs 15, 16. *Entedonomphale bicolorata*, female (paralectotype of *Thripoctenoides gaussi*): (15) antenna, (16) forewing. Scale lines = 0.1 mm.

Petiole conspicuous, longer than wide (length/width ratio about 1.5:1). Ovipositor relatively short, occupying a little less than 1/2 length of gaster, not exserted; ovipositor length/metatibia length ratio about 1.3:1.

Measurements (n=1, holotype). Body: 1661. Antenna: scape: 203; pedicel: 64; F1: 38; F2: 36; clava: 139. Forewing: 923/339; longest marginal seta: 97. Hind wing: 824/136; longest marginal seta: 96. Ovipositor: 358.

Male (paratype). Body length 1292. Generally similar to female except for colouration of antenna (all segments brown) and normal sexually dimorphic features such as antenna and genitalia. Vertexal suture indistinct. Antenna (Fig. 13) with a 2-segmented funicle and a solid clava; flagellar segments with numerous long setae. Petiole a little shorter than in female. Genitalia as in Fig. 14.

Holotype: Female on slide, labelled: 1. "Mich. Jackson Co., Waterloo rec. area, emerged 8.VI-1982 Bernie Crespi"; 2."Host: *Elathrothrius* [sic!] *tuberculatus*"; 3. "Mounted at UCR/ERM by V.V. Berezovskiy 2004 in Canada balsam. CNCI"; 4. (red) "*Entedonomphale boccaccioi* S. Triapitsyn HOLOTYPE ♀ " [CNCI]. Paratypes: USA: *Michigan*: same data as the holotype, 1♀ 1♂ on slides [CNCI].

Hosts: *Elaphrothrips tuberculatus* (Hood). The generic name of the host is misspelled on the original labels of the type specimens.

Entedonomphale bicolorata (Ishii, 1933), **comb. n.**

Figs 15, 16

Thripoctenus bicoloratus Ishii, 1933: 15, 16, pl. I. (Type locality: Ikiriki, Nagasaki, Japan)
Thripoctenoides gaussi Ferrière, 1958: 321–323. **Syn. n.**
Ceranisus bicoloratus (Ishii): Boucek & Askew 1968: 137; Loomans & van Lenteren 1995: 129, 130, 196.
Thripoctenoides gaussi Ferrière: Boucek & Askew 1968: 138; Trjapitzin 1978: 426.
Entedonastichus gaussi (Ferrière): Boucek 1988: 733; Loomans & van Lenteren 1995: 146–149, 197.

Diagnosis: This species was well described and illustrated (habitus only) by Ishii (1933). Female. Body dark brown to black, shining; appendages generally brown to dark brown except F1 white. Head with vertexal suture a little sinuate. Antenna (Fig. 15) with scape relatively slender, a little wider in basal half than in distal half, about 4.5 x as long as wide; pedicel slightly longer than wide and about as long as F1 or F2; flagellar segments with numerous long setae and sensilla; F2 a little wider than F1, clava about 2 x as long as wide, about equal to combined length of funicle segments. Midlobe of mesoscutum with 2 pairs of setae. Forewing (Fig. 16) relatively wide, about 2.5 x as long as wide; longest marginal setae about 3/10 maximal width of forewing; disc hyaline, bare in basal 2/5 of the wing and densely setose distad of about mid-level of marginal vein. Hind wing about 7 x as long as wide, with about 3-4 irregular rows of setae. Coxae smooth. Petiole trapezoidal in dorsal view, about as long as wide. Ovipositor not exserted, occupying about 3/5 length of gaster; ovipositor length/metatibia length ratio about 1.2:1.

Male. Unknown.

Type material examined: 3 female ?syntypes of *T. bicoloratus* were deposited in the collection of the Imperial Agricultural Experiment Station (Ishii 1933) but as of now are lost (Loomans & van Lenteren 1995).

Lectotype female of *T. gaussi* on a slide [MHNG], here designated to avoid possible confusion regarding the status of the type specimens of this species, labelled as follows: 1. "Allemagne Wittental X.1957 - Gauss Ex. *Liothrips setinodis*"; 2."Entedoninae: *Thripoctenoides gaussi* n. sp. Ch. Ferrière."; 3. "[red] *Thripoctenoides gaussi* Ferrière LECTOTYPE ♀ Des. by S. Triapitsyn 2002"; 4. "*Entedonomphale bicolorata* (Ishii) ♀ Det. S. Triapitsyn 2004". Paralectotypes of *T. gaussi* (here designated): 3 females on 2 slides [MHNG] and 1 female on point [BMNH], same original label data as on the lectotype slide. An additional non-type slide in MHNG (same original labels as the lectotype) contains several pupae of *T. gaussi* as well as remains of the host. The type locality of *T. gaussi* is in Schwarzwald, Baden-Württemberg, Germany: Ichenheim/Lahr according to Ferrière (1958) but Wittental (?Stegen-Wittental) according to the labels on the original cotype slides.

Other material examined: JAPAN: *Shimane Pref.* (Honshu Island): Izumo ("Host: *Liothrips wasabiae* Haga et Ok."): em. 1.iv.1990, T. Murai, 4♀ [HFES]; em. 1.iv.1991, T. Murai, 5♀ [HFES, UCRC]. Sada-Cho, 13.ix.1990, T. Murai, 8♀ ("ex. *Liothrips wasabiae* on Japanese horse reddish") [UCRC].

Distribution: Japan, Germany, and Ukraine (Loomans & van Lenteren 1995, as *E. gaussi*).

Hosts: Various Phlaeothripidae listed by Loomans and van Lenteren (1995) for *Entedonastichus gaussi* as well as *Liothrips wasabiae* Haga & Okajima (T. Murai pers. comm.; Loomans & van Lenteren 1995) and also an unidentified thrips species (Ishii 1933).

Comments: The examined specimens from Japan and Germany are identical, hence this obvious synonymy of *T. gaussi* under *E. bicolorata*.

Entedonomphale esenini sp. n.

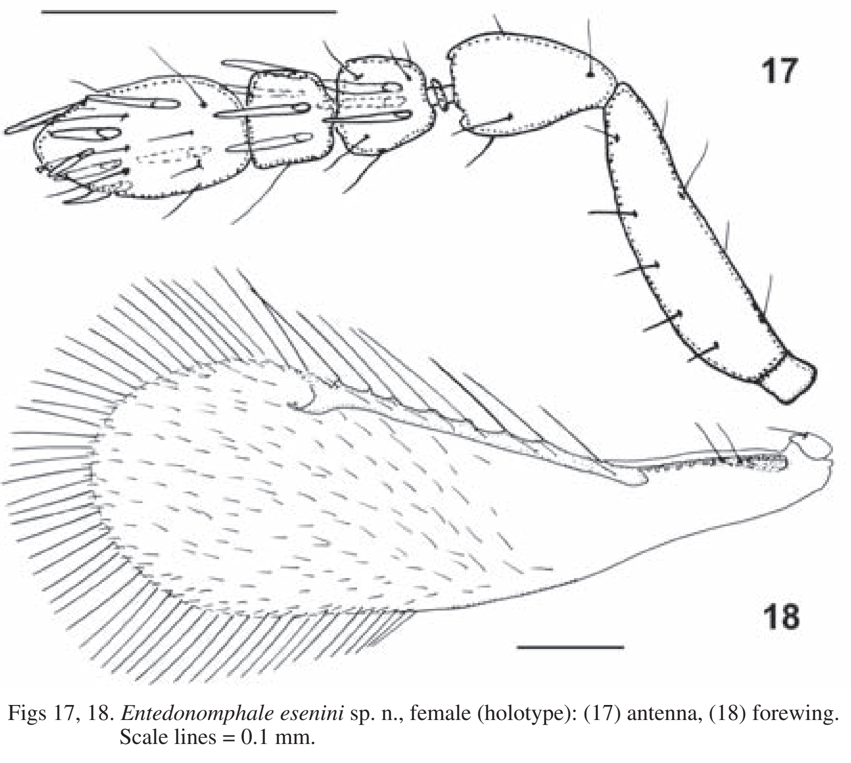
Figs 17, 18

Etymology: This species is named after Russian poet Sergei A. Esenin.

Diagnosis: This species is defined based on the unique combination of the following morphological features: funicle segments of female antenna subequal and about as long as wide, each with several sensilla; midlobe of mesoscutum with 1 pair of setae; forewing disc hyaline, more or less evenly setose in the apical half (setae moderately long), bare in the basal half.

Description: Female (holotype). Body brown, appendages mostly light brown.

Vertexal suture distinct, angulate. Antenna (Fig. 17) with scape slender, about 4.0 x as long as wide; F1 and F2 subequal, about as long as wide and each with several sensilla; clava small, a little longer than funicle, about 1.9 x as long as wide, with several sensilla.



Figs 17, 18. *Entedonomphale esenini* sp. n., female (holotype): (17) antenna, (18) forewing. Scale lines = 0.1 mm.

Mesosoma a little shorter than metasoma, smooth. Midlobe of mesoscutum with 1 pair of setae; anterior margin of scutellum angulate. Forewing (Fig. 18) about 3.0 x as long as wide; longest marginal setae 0.45 x maximal forewing width; disc hyaline, more or less evenly setose in apical half of forewing (setae moderately long), bare in basal half. Hind wing about 6.0 x as long as wide; disc hyaline and with a few scattered setae; longest marginal setae almost equal to hind wing width. Hind coxa smooth.

Petiole conspicuous, almost as wide as long. Ovipositor occupying about 1/2 length of gaster, not exserted; ovipositor length/metatibia length ratio about 1.1:1.

Measurements (n=1, holotype). Body: 941. Antenna: scape: 109; pedicel: 54; F1: 31; F2: 31; clava: 78. Forewing: 675/227; longest marginal seta: 103. Hind wing: 595/100; longest marginal seta: 103. Ovipositor: 215.

Male. Unknown.

Holotype: female on slide, labelled: 1. "MADAGASCAR: 43 km S Ambalauao, Rsrv. Andringintro, 22°14'S:47°00'E, 5.x.1993, 825 m, B.L. Fisher #747 (1)"; 2. "UC Davis (R. Burks loan) Mounted at UCR/ERM by V.V. Berezovskiy 2004 in Canada balsam"; 3. (red) "*Entedonomphale esenini* S. Triapitsyn HOLOTYPE ♀ " [UCDC].

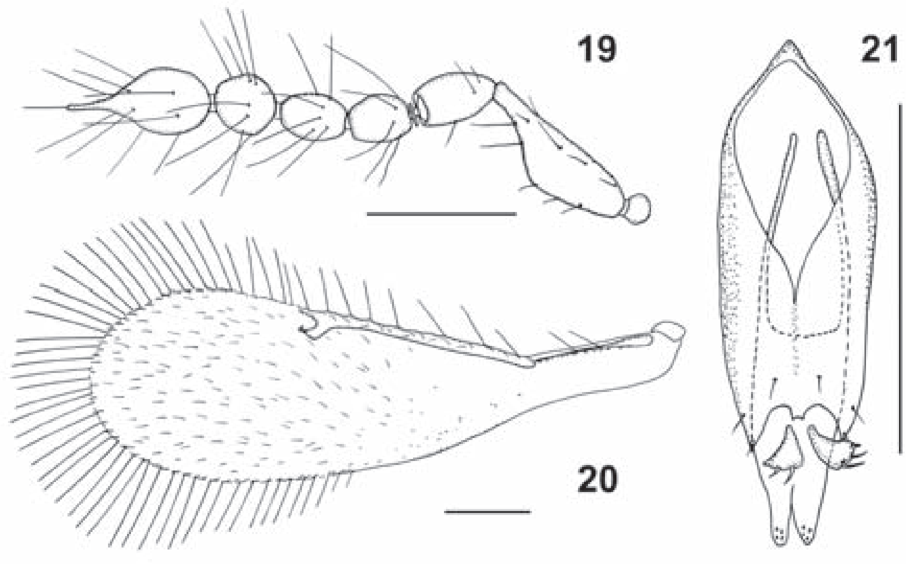
Hosts: Unknown.

Entedonomphale kaulbarsi (Yoshimoto, 1981), **comb. n.**

Figs 19–21

Thripoctenoides kaulbarsi Yoshimoto, 1981: 723–725. (Type locality: Riceville, Ontario, Canada)
Entedonastichus kaulbarsi (Yoshimoto): Boucek 1988: 733; Loomans & van Lenteren 1995: 146–148, 197; Triapitsyn & Headrick 1995: 229 (key).

Diagnosis: This is the only known species of *Entedonomphale* with a brachypterous female, well described by Yoshimoto (1981). I have little doubt in associating the numerous full-winged males of this genus, collected from the same general area as the known females of *E. kaulbarsi*, with this species. First, no females of any other species



Figs 19–21. *Entedonomphale kaulbarsi*, male (Ottawa Airport, Ontario, Canada): (19) antenna, (20) forewing, (21) genitalia. Scale lines = 0.1 mm.

of *Entedonomphale* have ever been captured in well-collected south-eastern Canada; second, these males resemble males of the European *E. carbonaria*, as both have a 3-segmented funicle and a solid clava. In fact, apart from having brachypterous females, both sexes of *E. kaulbarsi* are strikingly similar to those of *E. carbonaria*, including colouration, shape and proportions of female and male antennae and male forewing, etc. For the time being, however, I prefer to keep both of them as valid species, until more evidence of their possible conspecificity (or otherwise) is obtained. A brief description of the male of *E. kaulbarsi* follows.

Description: Male. Body length 700–1100. Colour: head and mesosoma dark brown, metasoma and appendages brown.

Vertexal suture straight and faint, not as distinct as in female. Antenna (Fig. 19) with scape expanded in basal half (as in female), about 3 x as long as wide, with faint cellulate sculpture; pedicel a little longer than any funicle segment; flagellum with 3 funicle segments and a solid clava, each flagellar segment with numerous long setae (their length exceeds width of segment) and several short sensilla; F1, F2, and clava a little longer than wide, F3 almost globular.

Mesosoma a little shorter than metasoma, almost smooth; notauli indistinct, midlobe of mesoscutum with 1 pair of setae. Forewing (Fig. 20) 3.1–3.2 x as long as wide; longest marginal setae about or slightly more than 1/2 maximal forewing width; disc slightly infumated (evenly brownish) behind marginal vein and with about 7–9 irregular rows of setae in the broadest part beyond venation, almost bare basally. Hind wing about 8 x as long as wide; disc with about 3 irregular rows of setae. Coxae lightly sculptured.

Petiole trapezoidal in dorsal view, a little longer than wide. Genitalia as in Fig. 21; digitus with 2 spines.

Type material examined: Holotype female and paratype females in CNCI (detailed label data provided in the original description).

Other material examined: CANADA: *Ontario*: 3 km N Almonte, 12.v–24.viii.1986, J. Denis, Dumouchel, 8♂ [CNCI]. Chatterton, 13 mi. N Belleville, C.D. Dondale (det. Z. Boucek): 15.viii.1967, 1♀; 4.ix.1968, 1♀ [BMNH]. Near Kemptville, 7–17.vii.1984, J. Denis, 1♂. Malakoff, 27–29.vi.1985, P.T. Foottit, 1♂. Manitoulin Island, 3.2 km S Maple Pt., 4.vii–25.ix.1981, A.J. Ritchie, 1♀. Ottawa, 3–10.vi.1986, H. Goulet, 1♂. Ottawa Airport, 14–28.vi.1985, J. Denis, 5♂. Shirleys Bay, 15 km W Ottawa, M. Kaulbars: 1–15.vii.1984, 1♂; 1–15.viii.1984, 1♂; 1–15.x.1984, 3♂. St Lawrence National Park, Grenadier Island Centre, E. Sigler: 11.vi.1975, 1♂; 2.vii.1975, 7♂ [CNCI]. *Quebec*: Gatineau Park near Luskville Falls: 9–21.v.1986, H. Goulet, 1♂ [BMNH]; 2–9.ix.1986, J. Denis, 1♂ [CNCI].

Distribution: Canada. Occurrence of this species in Florida, USA (Yoshimoto 1981) is very unlikely and needs to be verified because the only specimens of *E. kaulbarsi* in BMNH, identified by Dr Z. Boucek, were collected in Ontario, Canada, but not in Florida.

Hosts: Unknown.

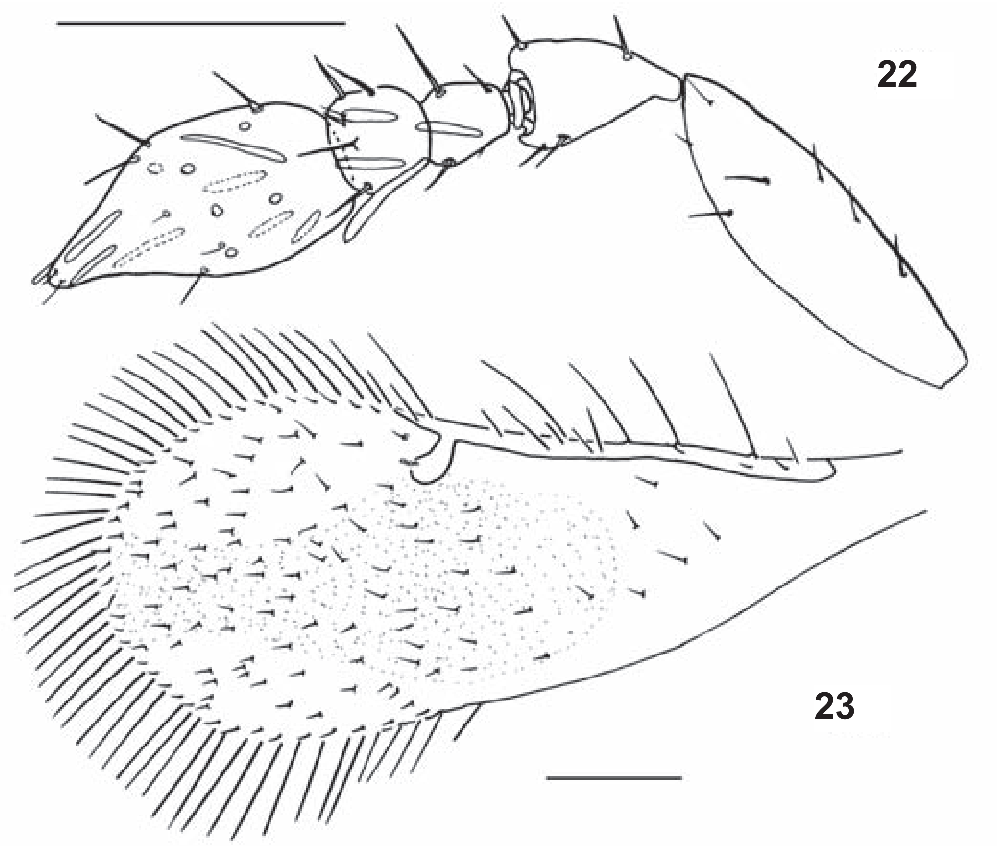
Entedonomphale mira (Girault, 1920), **comb. n.**

Figs 22, 23

Entedonastichus mirus Girault, 1920*b*: 143. (Type locality: Irvinebank, Queensland, Australia)

Entedonastichus mirus Girault: Dahms 1984: 827; Boucek 1988: 733; Loomans & van Lenteren 1995: 146–148, 197.

Diagnosis: Female. Body dark brown to black, smooth and shining; appendages light brown to dark brown. Antenna (Fig. 22) with scape expanded in the middle; F1 notably



Figs 22, 23. *Entedonomphale mira*, female (holotype): (22) antenna, (23) forewing. Scale lines = 0.1 mm.

smaller than F2, a little longer than wide and with 1 sensillum; F2 about as long as wide and with several sensilla; clava (collapsed in the holotype but oval in the correctly dried specimen from near Ellis Beach, Queensland) with several short sensilla. Notauli indistinct. Forewing disc with a few scattered setae behind marginal vein, more densely setose in the broadest part beyond venation, notably pigmented (with brown) in the middle, the dark spot narrowing distad of stigmal vein and reaching wing apex (Fig. 23). Petiole about as long as wide. Ovipositor not exserted.

Male. Unknown.

Type material examined: Parts of the holotype female on slide [QMBA], labelled: 1. “Holotype T.9263. E.C.D. 1984”; 2. “*Entedonastichus mirus* Girault ♀ type”; 3. “*Eulophomorpha flavicornis* Dodd. ♀ head, ant.”. The type slide has fragments of two broken coverslips with both antennae and one forewing of the holotype of *Entedonastichus mirus*; the remaining body parts (mesosoma, metasoma, several legs, and at least one hind wing, which is stuck in glue) are on a card at QMBA, labelled: 1.” *Entedonastichus mirus* Girault ♀ Type”; 2. “HOLOTYPE. T.9263 E. C. D. 1984”.

Other material examined: AUSTRALIA: *Queensland*: 10 km N Ellis Beach, 25.iv.1988, E.C. Dahms, G. Sarnes, 1♀ [QMBA]. Ipswich District, 3.vi.1980, J.S. Noyes, 1♀ (det. Z. Boucek) [BMNH].

Distribution: Australia (Queensland).

Hosts: Unknown.

Entedonomphale dei (Girault, 1922), **comb. n.**

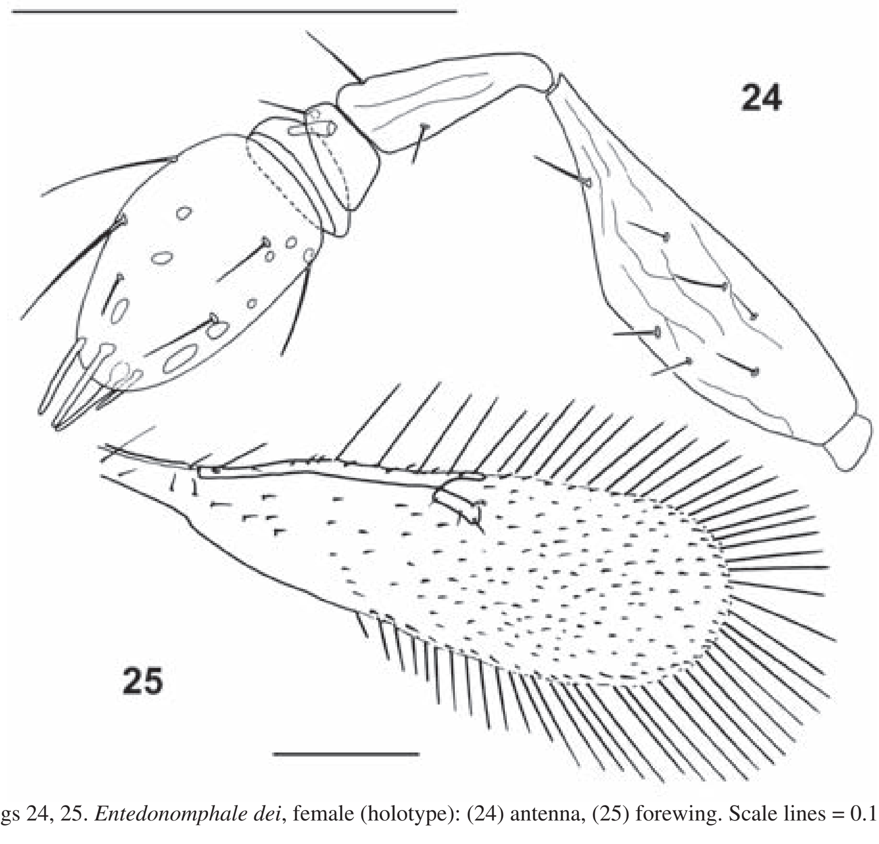
Figs 24, 25

Pirenoidea dei Girault, 1922: 107, 108. (Type locality: Brisbane, Queensland, Australia)
Pirenoidea dei Girault: Dahms, 1983: 215.
Entedonastichus dei (Girault): Boucek 1988: 733; Loomans & van Lenteren 1995: 146–148, 197.

Diagnosis: Female. Head and mesosoma brown to dark brown and smooth, metasoma brown, antenna and legs pale to light brown. Antenna (Fig. 24) attached just below lower ocular line, with scape expanded in basal half, sharply narrowing toward apex; F1 and F2 appressed, notably wider than long, F2 wider than F1; clava oval, with several sensilla. Notauli indistinct, opposite to what was stated in the original description of *Pirenoidea* by Girault (1922). Forewing disc with a few scattered setae behind marginal vein but more or less evenly setose beyond venation (setae very short), slightly infumated behind stigmal and marginal veins (dark spot not reaching wing's posterior margin or base of marginal vein); longest marginal setae 1/2–3/5 maximal width of forewing (Fig. 25). Disc of hind wing hyaline. Ovipositor short, barely exserted.

Male. Unknown.

Type material examined: Holotype female [QMBA], apparently invalidly designated by Boucek (1988) as a lectotype (there is no reason whatsoever to believe that A.A. Girault described this species from more than one specimen), label data as follows: 1. "Holotype T.8734 E.C.D."; 2. "*Pirenoidea dei* Gir. ♀ type Clayfield Brisbane Sweeping herbage 8.4.13. H. Hacker". According to Dahms (1983), the second part of the second



Figs 24, 25. *Entedonomphale dei*, female (holotype): (24) antenna, (25) forewing. Scale lines = 0.1 mm.

label refers to the male encyrtid mounted on the same slide under a different coverslip. The holotype specimen is in poor condition, broken into many parts, as follows: 4 broken off legs, clava, pedicel with F1, F2, head with right antenna, metasoma with left forewing, 2 legs (middle and hind).

Other material examined: AUSTRALIA: *Queensland*: Mt Glorious, 21.x.1982–13.i.1983, A. Hiller, 1♀ [QMBA]. NEW ZEALAND: Roaring Meg, 13.i.1981, J.S. Noyes, E.W. Valentine, 1♀ (det. Z. Boucek) [BMNH].

Distribution: Australia (Queensland) and New Zealand.

Hosts: Unknown.

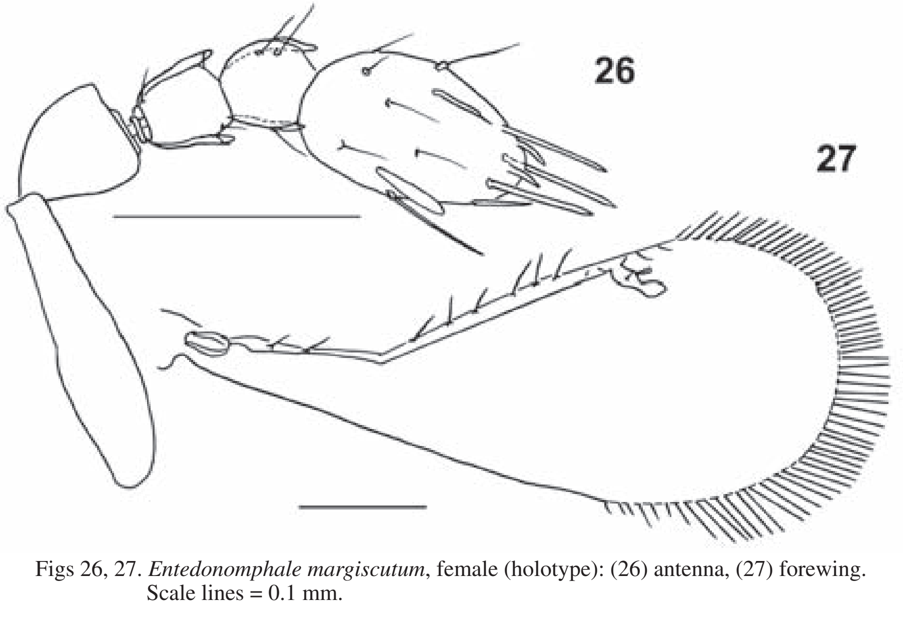
Comments: I was not able to find the voucher specimens of the species reported by Goodwin and Steiner (1996) from the Australian states of New South Wales and Northern Territory as *E.* ?*dei*.

Entedonomphale margiscutum Girault, 1915, **stat. rev.**

Figs 26, 27

Entedonomphale margiscutum Girault, 1915: 216. (Type locality: Bank of Tweed River, Chindera [= Chinderah], New South Wales, Australia)
Entedonomphale stalini Girault, 1934: 2. Synonymised under *Ceranisus margiscutum* (Girault) by Boucek 1988: 734.
Entedonomphale margiscutum Girault: Dahms 1984: 792, 793.
Entedonomphale stalini Girault: Dahms 1986: 562.
Ceranisus margiscutum (Girault): Boucek 1988: 734; Loomans & van Lenteren 1995: 130, 196.

Diagnosis: Female. Body mostly brown to dark brown; midlobe of mesoscutum (narrow stripes laterally and posteriorly only), antenna, and legs light brown. Head: malar sulcus apparently straight, not split ventrally; vertexal suture angulate (broadly V-shaped). Antenna (Fig. 26) with scape relatively slender, 4.3–5.1 x as long as wide; F1 and F2 subequal and slightly longer than wide (F2 a little wider), both with several sensilla; clava oval, with several sensilla. Dorsal mesosoma with fine cellulate sculpture; notauli



Figs 26, 27. *Entedonomphale margiscutum*, female (holotype): (26) antenna, (27) forewing. Scale lines = 0.1 mm.

indistinct; midlobe of mesoscutum with 2 pairs of short setae. Forewing (Fig. 27) about 2.5 x as long as wide; disc with numerous very short setae behind and beyond marginal and stigmal veins (these setae so inconspicuous that forewing disc appears asetose), slightly infumated behind stigmal vein (darker spot not reaching wing's margins or base of marginal vein); longest marginal setae about 1/4 maximal width of forewing. Hind wing about 6.5 x as long as wide; disc hyaline and with numerous very short and inconspicuous setae, similar to ones on forewing; longest marginal setae about equal to maximal width of hind wing. Petiole trapezoidal, about as wide as long; ovipositor occupying about 4/5 length of gaster, not exserted; ovipositor length/metatibia length ratio about 1.6:1.

Male. Unknown.

Type material examined: Holotype female of *E. margiscutum* [QMBA], labelled: 1. Type Hy/2544. 2545 A. A. Girault"; 2. "Queensland Museum *Parzaommomyia tenuicorpus* Gir. ♀ "; 3. "*Entedonomphale margiscutum* Gir. ♀ ". Holotype dissected into many parts under two coverslips (middle and bottom ones, the upper coverslip contains parts of the holotype of another entedonine eulophid, *Parzaommomyia tenuicorpus* Girault, 1915); metasoma, mesosoma with all the legs, and one forewing mounted under the middle coverslip, head with antennae mounted under the bottom coverslip, one forewing is missing.

Holotype female of *E. stalini* [QMBA], labelled: 1. Holotype T.9997. E.C.D. 1985"; 2. "Dep. Ag. & Stk. Qld. ♀ *Entedonomphale stalini* Girault Indooroopilly Type No. 11 Dec. 1932 Window". Only the metasoma (lateral), mesosoma, several legs (detached from the body), and a part of head remain from the holotype specimen, all are mounted under one broken coverslip.

Other material examined: AUSTRALIA: *Queensland*: Tea Tree Cave, 4 km SE Chillagoe, 17°11'S:144°34'E, 25.iv.1997, C.J. Burwell, 1♀ [QMBA].

Distribution: Australia (New South Wales, Queensland).

Hosts: Unknown.

Comments: Although Boucek (1988) transferred this taxon, which is the type species of the genus *Entedonomphale*, to *Ceranisus*, it is undoubtedly congeneric with the species placed by him in *Entedonastichus*. Availability of a high-quality slide-mounted specimen of *E. margiscutum* from Queensland, Australia, was crucial for confirmation of its true identity following my examination of the poorly mounted holotype of this species, the only specimen studied by Dr Z. Boucek. All morphological features of *E. margiscutum* fit well in the current generic concept of *Entedonomphale* with the exception of a straight malar sulcus, but this character does not seem to be reliable in differentiating *Entedonomphale* from *Ceranisus* as at least one species of the latter has a distinctly split malar sulcus whereas at least in *E. margiscutum* and *E. quasimodo* sp. n. it is clearly straight.

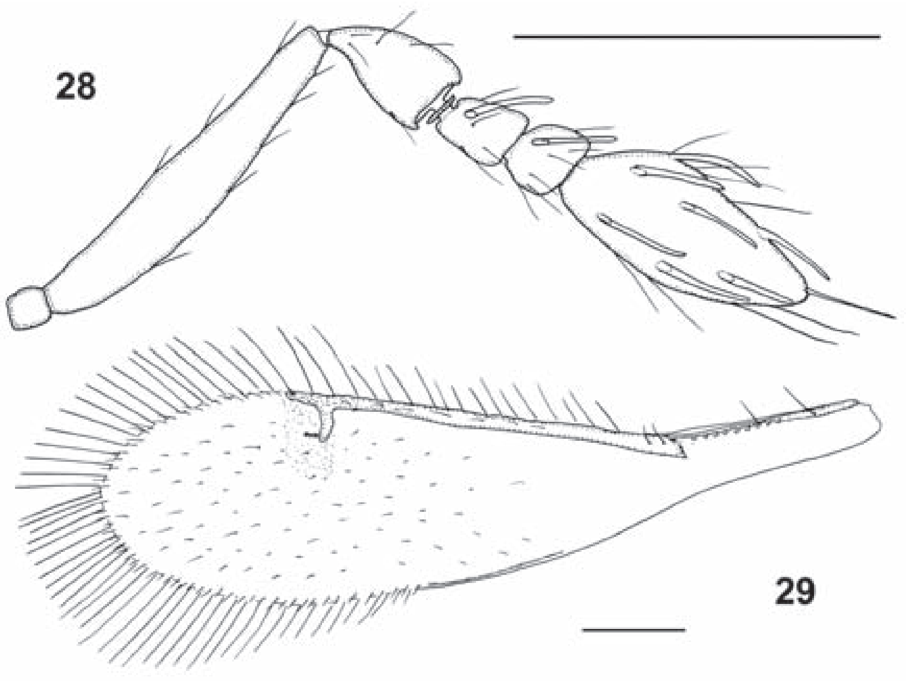
Boucek (1988) synonymised *E. stalini* under *E. margiscutum* and he might be right, based on the comparison between the fresh specimen of *E. margiscutum* from Queensland and the very short original description of *E. stalini*. However, the true identity of this species will never be revealed as only a few body parts remain from the holotype female specimen.

Entedonomphale lermontovi sp. n.

Figs 28, 29

Etymology: This species is named after Russian poet Mikhail Yu. Lermontov.

Diagnosis: This species can be easily recognised by its light brown body and a narrow forewing (length/width ratio about 3.7:1).



Figs 28, 29. *Entedonomphale lermontovi* sp. n., female (holotype): (28) antenna, (29) forewing. Scale lines = 0.1 mm.

Description: Female (holotype and paratype). Body and appendages mostly light brown, with some brown on middle and hind tibiae and metasomal terga.

Vertexal suture faint and indistinct. Antenna (Fig. 28) with scape slender, about 5.8 x as long as wide; F1 a little longer than wide, F2 slightly wider than long, each with 1 sensillum; clava longer than funicle, about 2.4 x as long as wide, with several sensilla.

Mesosoma markedly shorter than metasoma, almost smooth. Midlobe of mesoscutum with 2 pairs of setae; anterior margin of scutellum slightly angulate. Forewing (Fig. 29) about 3.7 x as long as wide; longest marginal setae about 0.5 x maximal forewing width; disc with slight brown pigmentation behind marginal (its distal half only) and stigmal veins, more or less evenly setose in apical half of forewing. Hind wing about 7.5 x as long as wide, with disc hyaline; longest marginal setae about 1.5 x hind wing width. Hind coxa lightly sculptured.

Petiole conspicuous, much longer than wide. Ovipositor short, occupying about 2/5 length of gaster, not exserted; ovipositor length/metatibia length ratio about 1.1:1.

Measurements (n=1, holotype). Body: 1439. Antenna: scape: 176; pedicel: 58; F1: 35; F2: 31; clava: 115. Forewing: 787/212; longest marginal seta: 112. Hind wing: 576/76; longest marginal seta: 118. Ovipositor: 291.

Male. Unknown.

Holotype: Female on slide, labelled: 1. “S. Africa: Trans. [Transvaal, South Africa], 15 km E. Klaserie, Guernsey Farm, 19–31.xii.1985, M. Sanborne CNCI”; 2. (red) “*Entedonomphale lermontovi* S. Triapitsyn HOLOTYPE ♀ ” [SANC].

Paratype: 1♀ on slide [CNCI], labelled: “S.A.K.N.P. [Kruger National Park, South Africa], Skukuza, XII-12–15.1985, yellow M. Sanborne mal.”.

Hosts: Unknown.

Comments: The holotype is mounted laterally. The metasoma of the paratype specimen is missing. In addition to the holotype and paratype specimens, there is a point in CNCI, labelled same as the holotype of *E. lermontovi* sp. n., which has only a forewing and a leg glued onto it; these remains of a specimen apparently belong to this species. For obvious reasons that specimen is not included in the type series.

Entedonomphale nubilipennis (Williams, 1916), **comb. n.**

Fig. 30

Thripoctenus nubilipennis Williams, 1916: 55, 56. (Type locality: Forest Hills, Massachusetts, USA)
Cryptomphale nubilipennis (Williams): Girault 1917*a*: 2.
Thripoctenus nubilipennis Williams: Peck 1951: 442.
Ceranisus nubilipennis (Williams): Peck 1963: 117; Burks 1979: 1006; Loomans & van Lenteren 1995: 129–130, 196; Triapitsyn & Headrick 1995: 230–232 (designation of a lectotype and paralectotypes, redescription), 243 (figs 5, 6).

Diagnosis: This species was redescribed and illustrated by Triapitsyn and Headrick (1995). F1 of female antenna with a sensillum, F2 much wider than long. Midlobe of mesoscutum with 2 pairs of setae; anterior margin of scutellum angulate. Male antenna (Fig. 30) with clava 3-segmented, distal segment with a long apical spicula.

Type material examined: In USNM (see Triapitsyn & Headrick 1995).

Distribution: USA (Massachusetts).

Hosts: *Cryptothrips rectangularis* Hood and *Megalothrips spinosus* Hood (Williams 1916).

Comments: Girault (1917*a*) was actually absolutely right that this species does not belong in *Thripoctenus* (=*Ceranisus*), as also noted later by Triapitsyn and Headrick (1995).

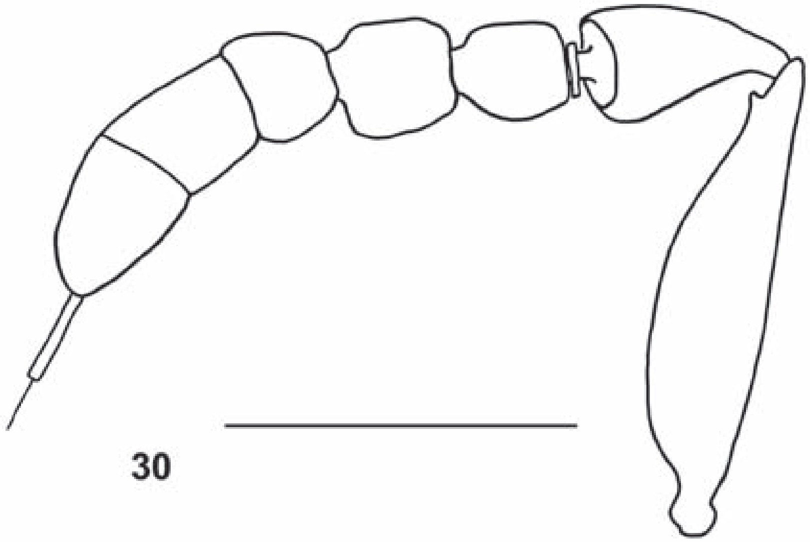


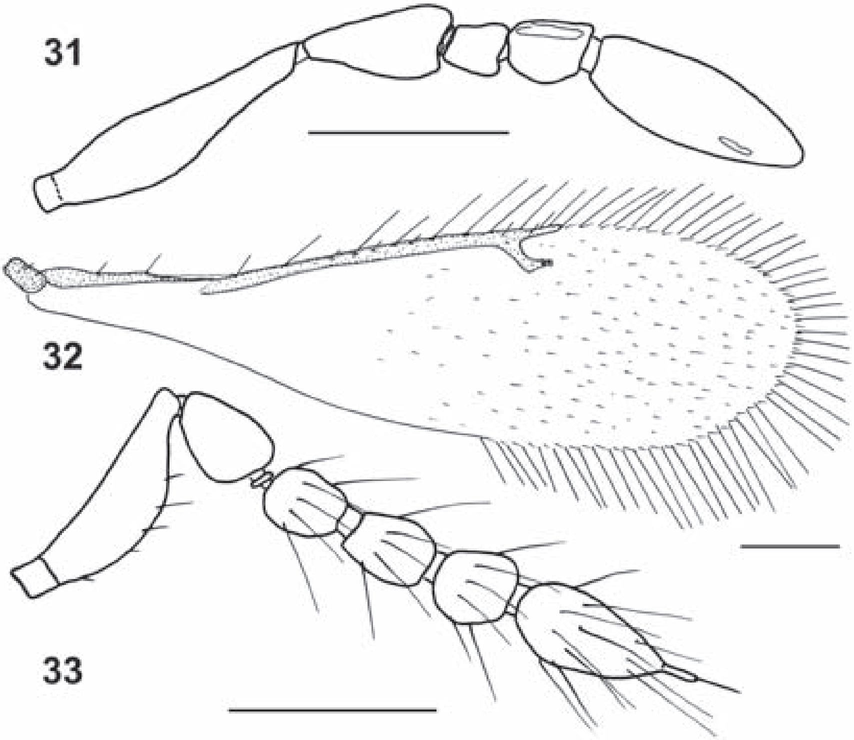
Fig. 30. *Entedonomphale nubilipennis*, male antenna (paralectotype). Scale line = 0.1 mm.

Entedonomphale carbonaria (Erdös, 1954), **comb. n.**

Figs 31–33

Thripoctenoides carbonarius Erdös, 1954: 345, fig. 12c (p. 346). (Type locality: Tompa, Hungary; of the lectotype designated by Thuróczy (1992))
Thripoctenoides carbonarius Erdös: Boucek & Askew 1968: 138; Trjapitzin 1978: 426.
Thripoctenoides albicoxis Szelényi, 1982: 387, 388. **Syn. n.**
Entedonastichus carbonarius (Erdös): Boucek 1988: 733; Thuróczy 1992: 155; Loomans & van Lenteren 1995: 146–148, 197.
Entedonastichus albicoxis (Szelényi): Thuróczy 1992: 151; Loomans & van Lenteren 1995: 146–148, 197.
Entedonastichus sp.: Loomans & van Lenteren 1995: 146, 148 (in part, from Russia only).

Diagnosis: Female. Body mostly dark brown to black and smooth, as described by Erdös (1954); scape slightly lighter than pedicel or flagellum, coxae pale (mostly laterally) to dark brown (dorsally), 3 basal tarsomeres brown, petiole light brown dorsally and whitish laterally. Antenna (Fig. 31) with scape about 4 x as long as wide, slightly dilated in basal half, pedicel much longer than wide, F1 shorter and narrower than F2 and apparently without sensilla, F2 with 1 sensillum; clava entire, not 3-segmented as mistakenly indicated in the original description by Erdös (1954) who had only dry-mounted specimens available to him, with several short longitudinal sensilla. Forewing (Fig. 32) about 3.5 x as long as wide; longest marginal setae about 2/5 maximal width of forewing; disc notably infuscated behind marginal vein (its distal half only) and also behind and shortly beyond stigmal vein, bare basally and with numerous short setae



Figs 31–33. *Entedonomphale carbonaria* (female – Nagyiván, male – Yácz-Szöd, Hungary): (31) female antenna, (32) female forewing, (33) male antenna. Scale lines = 0.1 mm.

scattered in distal half; postmarginal vein about as long as stigmal vein. Coxae partially with cellulate sculpture. Ovipositor short, not exserted, occupying about 0.7 x length of gaster, ovipositor length/metatibia length ratio about 1.1:1.

Male. Similar to female but antenna, legs, and petiole a little darker and infuscation of forewing disc considerably less pronounced. Antenna (Fig. 33) with 3-segmented funicle; clava solid, with apical spicula.

Type material examined: Paralectotype male of *Thripoctenoides carbonarius* Erdös [HNHM], designated by Thuróczy (1992), labelled: 1. "Tompa 1950.vi.30 dr. Erdös"; 2. "Vórós erdó füvcín"; 3. "*Thripoctenoides carbonarius* Erd. det. Erdös"; 4. "Cotypus"; 5. "Paratypus ♂ *Thripoctenoides carbonarius* Erd."; 6. "Hym. Typ. No. 5993 Mus. Budapest".

Holotype female of *Thripoctenoides albicoxis* Szelényi [HNHM], labelled: 1. "Hungaria, Nagyiván, 1972.vi.15"; 2. "Ex nido *Acrocephalus paludicola*"; 3. "Leg. Szabó László"; 4. "*Thripoctenoides albicoxis* sp. n. ♀ det. dr. Szelényi"; 5. "Holotypus *Thripoctenoides albicoxis* Szelényi"; 6. "Hym. Typ. No. 6919 Mus. Budapest".

Other material examined: HUNGARY: Baja, 30–31.v.1958, J. Erdös, 1♀ 1♂ ("Inter radices *Stipae capillatae* L.", det. G. Szelényi). Bátorliget, Kaszjló, 20.vi.1959, J. Erdös, 1♀ (det. G. Szelényi). Nagyiván, 5–6.v.1975, G. Szelényi, 2♀ ("Agrosti-Eleochari-Apopecuretum"). Pótharasztpta, 16.vii.1974, G. Szelényi, 1♀ (det. G. Szelényi). Szt. Miklós, L. Biró, 1♂. Vácz, Szöd, L. Biró: 31.viii.1925, 1♂; 1925, 1♂. Vácz, Tudósdomb, 3.viii.1930, L. Biró, 1♂ [HNHM]. RUSSIA: *Leningrad Region*: Petrokrepost', Shore of Lake Ladoga, 10.vii.1981, V.A. Trjapitzin, 1♂ [ZIN].

Distribution: Bulgaria (Loomans & van Lenteren 1995), Germany (Noyes 2002), Hungary, *Russia (Leningrad Region), Slovakia (Loomans & van Lenteren 1995), Slovenia and Sweden (Noyes 2002).

Hosts: Unknown.

Comments: Minor differences in the colouration of the holotype of *T. albicoxis* are within the variation range of *E. carbonaria*, hence the above synonymy.

Entedonomphale zakavyka sp. n.

Figs 34, 35

Entedonastichus carbonarius (Erdös): Boucek 1988: 733 (misidentification); Loomans & van Lenteren 1995: 146–148 (in part, from Australia only).

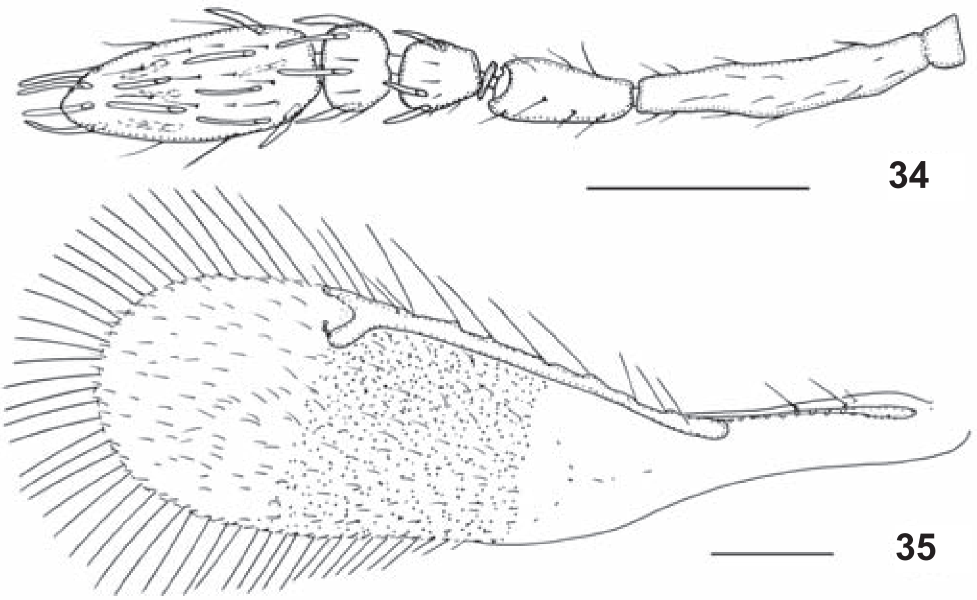
Etymology: The specific name has a meaning of a small problem in Russian, referring to the prior difficulties in correct identification of this species.

Diagnosis: Female of this species is practically indistinguishable from that of the European *E. carbonaria*, as noted by Boucek (1988) (however, F1 in female with several sensilla whereas that of *E. carbonaria* apparently without sensilla), but males of these two species can be easily separated by their antennae: the funicle is 2-segmented and the clava is 3-segmented in *E. zakavyka* sp. n., whereas the funicle is 3-segmented and the clava is solid in *E. carbonaria*.

Description: Female (holotype and paratypes). Body dark brown to black, antenna brown to dark brown, legs pale (three basal tarsomeres and parts of other segments) to brown and dark brown.

Vertexal suture faint. Antenna (Fig. 34) with scape relatively slender, only a little expanded in basal half; F1 slightly longer than wide, F2 a little wider than long, both funicle segments with several sensilla each; clava much longer than funicle, with numerous sensilla.

Mesosoma shorter than metasoma, smooth. Midlobe of mesoscutum with 2 pairs of setae; anterior margin of scutellum slightly sinuate, almost straight. Forewing (Fig. 35)



Figs 34, 35. *Entedonomphale zakavyka* sp. n., female (holotype): (34) antenna, (35) forewing. Scale lines = 0.1 mm.

about 2.4 x as long as wide; longest marginal setae about 0.5 x maximal forewing width; disc with a dark band behind stigmal and distal half of marginal vein (reaching posterior margin), more or less evenly setose in apical half of forewing. Hind wing about 8 x as long as wide; disc with several rows of setae, slightly infumated behind apex of venation. Hind coxa lightly sculptured.

Petiole conspicuous, much longer than wide (length/width ratio about 2.5:1). Ovipositor relatively short, occupying a little more than 1/2 length of gaster, not exserted; ovipositor length/metatibia length ratio about 1.2:1.

Measurements (n=1, holotype). Body: 1168. Antenna: scape: 133; pedicel: 64; F1: 37; F2: 33; clava: 124. Forewing: 726/212; longest marginal seta: 106. Hind wing: 633/82; longest marginal seta: 96. Ovipositor: 285.

Male (paratype). Body length 793. Similar to female (including pigmentation of forewing disc) except for colouration of legs (almost all dark) and normal sexually dimorphic features such as antenna and genitalia. Antenna with a 2-segmented funicle (F1 subequal to F2, both a little longer than wide) and a large 3-segmented clava with a long apical spicula, claval segments about as wide as funicle segments; all flagellar segments with numerous long setae.

Holotype: Female on slide, labelled: 1. “15.19S 145.03E Station Ck 7 Km WSW Hope Vale mission Q [Queensland, Australia] 10 May 1981 I. D. Naumann ex ethanol”; 2. “Mounted at UCR/ERM by V. V. Berezovskiy 2004 in Canada balsam. ANIC”; 3. “*Entedonastichus* Det. J. LaSalle”; 4. (red) “*Entedonomphale zakavyka* S. Triapitsyn HOLOTYPE ♀ ” [ANIC].

Paratypes: AUSTRALIA: *Queensland*: 2 km S Horseshoe Lookout, Blackdown Tab., 23–24.iv.1981, I.D. Naumann, 1♀ on point (“*Thripoctenoides* (?) *carbonarius* Erd. det. Z. Boucek, 1986) [ANIC]. Mundubbera, vi.2000, C. Freebairn, 1♀ 1♂ on cards [UCRC].

Hosts: Unknown.

Entedonomphale sp.

(Not included in the key)

Diagnosis: Female. Unknown.

Male. Body and appendages dark brown to black. Antenna with a 2-segmented funicle and a 3-segmented clava; forewing slightly infuscated behind and just beyond venation, longest marginal setae a little more than 1/2 width of forewing.

Habitually, this male resembles that of the North American *E. nubilipennis*, but relative proportions of their antennal segments seem to be slightly different. I suppose this specimen from the State of Victoria, Australia, might be an undescribed species but its poor condition (it is uncleared and badly shriveled on a slide) prevents me from making a more precise identification.

Material examined: AUSTRALIA: *Victoria*: 19.vii.1917, 1♂ (California State Insectary No. 3926, "Ex. eggs of jassid") [UCRC].

Hosts: Unknown. According to the label, it was obtained from eggs of a leafhopper, but that record was obviously due to a mistake.

Genus *Ceranisus* Walker, 1841

Ceranisus Walker, 1841: vi, pl. N, fig. 2. Type-species: *Cirrospilus pacuvius* Walker, 1838, by monotypy.

Thripoctenus Crawford, 1911: 233. Type-species: *Thripoctenus russelli* Crawford, 1911, by monotypy. Synonymised under *Ceranisus* by Graham 1959: 203.

Epomphale Girault, 1915: 211. Type-species: *Epomphale auriventris* Girault, 1915, by original designation. Synonymised under *Ceranisus* by Boucek 1988: 733.

Ceranisus Walker: Graham 1959: 203, 1963: 270, 271; Boucek & Askew 1968: 137, 138; Boucek 1988: 733, 734; Schauff 1991: 38, 39; Loomans & van Lenteren 1995: 98, 99, 196; Triapitsyn & Headrick 1995: 230; Triapitsyn & Morse 2005: 70.

Diagnosis: Body and appendages usually yellow to dark brown or black; occipital suture present and usually conspicuous (can be straight, sinuate, or angulate); frontal grooves reaching eye at level of anterior (median) ocellus; malar sulcus present and straight in most species, very rarely split (Y-shaped); mandible reduced (without teeth); female flagellum with 2 funicle segments and a distinct clava (usually 2-, very rarely 3-segmented), apical claval segment with an apical spicula in both sexes; male antenna often with a swollen scape, male flagellum with funicle 2-segmented and clava 3-segmented; notauli usually indistinct, sometimes distinct but faint; midlobe of mesoscutum almost always with 2 pairs of setae (except with 1 such pair in most *C. russelli* (Crawford)); anterior margin of scutellum straight; forewing broadened beyond submarginal vein; petiole at most as long as wide, usually notably wider than long.

Biology: Larval parasitoids of various Thripidae (Terebrantia).

Comments: There seem to be at least four distinct groups of species within *Ceranisus*: the *menes* species group, containing *C. menes*, *C. planitianus*, and *C. udnamtak* sp. n. (forewing with a distinct semi-oval bare area at the posterior margin behind base of marginal vein, demarcated anteriorly by a sinuate line of setae; in the species with known males, scape of male antenna relatively slender, at most a little dilated in the middle); the *pacuvius* species group, containing *C. pacuvius*, *C. americensis*, *C. antalyacus*, *C. hoddlei*, *C. lepidotus*, *C. loomansi* and *C. nigrifemora* (forewing setose or at most with a narrow bare area along posterior margin behind base of marginal vein, demarcated anteriorly by a more or less straight line of setae; scape of male antenna usually, but not always, notably swollen); the *russelli* species group, containing *C. russelli* (clava of female antenna usually 3-segmented and midlobe of mesoscutum usually with 1 pair of setae); and the *barsoomensis* species group, comprised of the single species, *C. barsoomensis* sp. n. (a very long ovipositor, strongly exserted beyond apex of gaster; vertexal suture strongly angulate, broadly Y-shaped). *C. femoratus* (for which no male is known) and *C. votetoda* sp. n. remain unassigned to any of these groups as they have morphological features characteristic of both the *pacuvius* and the *barsoomensis* species groups.

Key to the species of *Ceranisus*, females

1 Clava 3-segmented (at least on one of the antennae, best seen in slide-mounted specimens) .... *russelli* (Crawford)

– Clava 2-segmented 2

2(1) Ovipositor markedly exserted beyond apex of gaster (by about 1/3 of its total length, Fig. 38) .... **barsoomensis** sp. n.

– Ovipositor not exserted or only slightly exserted 3

3(2) Forewing disc with a distinct semi-oval bare area at posterior margin behind base of marginal vein, demarcated anteriorly by a sinuate line of setae (i.e., cubital setal line, as in Fig. 41) 4

– Forewing disc either without such bare area or, if a narrow bare area present along posterior margin behind base of marginal vein, it is demarcated anteriorly by a more or less straight cubital setal line (as in Figs 43, 48) 6

4(3) Gaster completely dark brown or black .... *planitianus* Erdös

– At least base of gaster yellow or light brown 5

5(4) F1 a little shorter or at most subequal to F2; postmarginal vein of forewing at most as long as stigmal vein, usually a little shorter .... *menes* (Walker)

– F1 a little longer than F2; postmarginal vein of forewing much longer than stigmal vein .... **udnamtak** sp. n.

6(3) Forewing fringe very short, longest marginal setae less than 1/10 maximal width of forewing (Fig. 43) .... **votetoda** sp. n.

– Forewing fringe relatively longer, longest marginal setae at least 1/5 maximal width of forewing 7

7(6) Base of gaster yellow to light brown 8

– Base of gaster brown to dark brown or almost black 9

8(7) Femora pale, yellow, or light brown .... *americensis* (Girault)

– Femora dark brown .... *nigrifemora* De Santis

9(7) Vertexal suture straight or a little sinuate (rounded) 10

– Vertexal suture distinctly angulate (broadly Y-shaped) .... *femoratus* (Gahan)

10(9) Basal claval segment longer than distal segment .... *antalyacus* S. Triapitsyn

– Basal claval segment shorter than or at most subequal to distal segment 11

11(10) Head and mesosoma dorsally notably reticulate, with well-pronounced dark green metallic luster [scape of male antenna not swollen, about 3.6 x as long as wide] .... *lepidotus* Graham

– Head and mesosoma dorsally almost smooth, at most with faint cellulate sculpturing (sometimes more obvious on mesoscutum) and slight greenish metallic luster [scape of male antenna notably swollen, less than 2.5 x as long as wide] 12

12(11) Forewing relatively broader (length/width ratio about 2.4:1) [scape of male antenna markedly swollen, 1.8–1.9 x as long as wide] .... *hoddlei* S. Triapitsyn & Morse

– Forewing relatively narrower (length/width ratio 2.8–3.0:1) 13

13(12) Scape relatively shorter (length/width ratio 4–5:1) [scape of male antenna strongly swollen, 1.4–1.7 x as long as wide] ....*pacuvius* (Walker)

– Scape relatively longer (length/width ratio about 7:1) [scape of male antenna moderately swollen, about 2.1 x as long as wide] .... *loomansi* S. Triapitsyn & Headrick

Ceranisus russelli (Crawford, 1911)

Thripoctenus russelli Crawford, 1911: 233. (Type locality: Compton, California, USA)

Ceranisus russelli (Crawford): Peck 1963: 117; Loomans & van Lenteren 1995: 119–123, 196; Triapitsyn & Headrick 1995: 232, 233 (designation of the lectotype and paralectotypes, redescription), figs 7, 8 (p. 243) and 18, 19 (p. 247); Triapitsyn & Morse 2005: 71.

Diagnosis: Female. See Triapitsyn and Headrick (1995). Female clava usually 3-segmented (at least on one of the antennae), but sometimes subdivision of the distal claval segment is difficult to see even in slide-mounted specimens.

Male. Unknown.

Type material examined: Lectotype female and 28 paralectotype females in USNM, listed by Triapitsyn & Headrick (1995), as well as 19 additional paralectotype females listed by Triapitsyn & Morse (2005).

Other material examined: 4 females on a slide (mounting media completely black), labelled: 1. " *Thripoctenus russelli* Crawf. bred fr. *Heliothrips fasciatus* Compton, Cal. U.S.A., IX/1911 R. S. BAGNALL " [BMNH]. These specimens apparently came from the same source as the type series of *C. russelli* (all collected during 1911 in Compton, California, USA, by H.M. Russell or/and J.E. Graf) but are not designated as paralectotypes because they lack an indication that they were sent to USNM under the number 618°, as the cotypes of this species had been (Crawford 1911).

Distribution: Canada (Triapitsyn & Morse 2005) and USA.

Hosts: See Loomans and van Lenteren (1995).

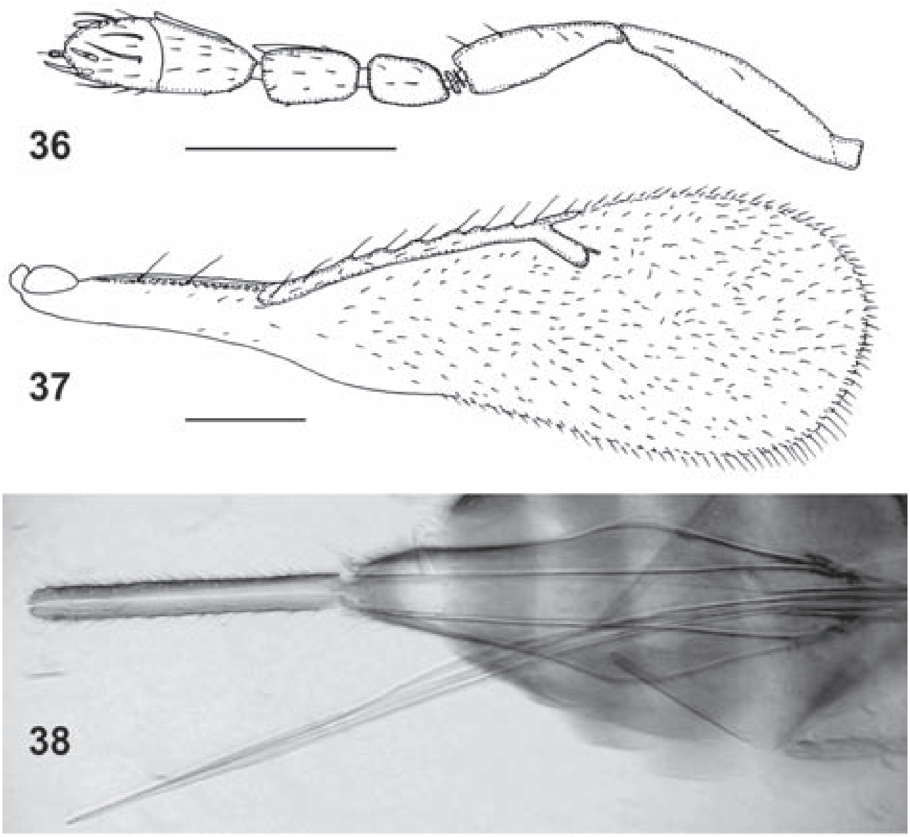
Comments: Initial placement of this species in *Ceranisus* was tentative (Triapitsyn & Headrick 1995) because its female has the following features characteristic of *Thripobius*: one pair of setae on the mesoscutal midlobe in the majority of specimens (two pairs in one of the paralectotypes), a 3-segmented clava (although only 2 segments are clearly visible in some specimens), and very long setae on the funicle segments (this is not a good generic character, however, even though it was used by Boucek (1976) in his key to separate *Thripobius* from *Ceranisus*). All other important morphological features, including a straight malar sulcus, suggest that this species rather belongs in *Ceranisus*.

Ceranisus barsoomensis sp. n.

Figs 36–38

Etymology: This species is so weird in habitus that it seems to be from Barsoom.

Diagnosis: This species stands alone among the known species of *Ceranisus* because of its unusual habitus (a very long body of the female with a very long, markedly protruding



Figs 36–38. *Ceranisus barsoomensis* sp. n., female (holotype): (36) antenna, (37) forewing, (38) ovipositor. Scale lines = 0.1 mm.

ovipositor), which is likely an adaptation to the morphology and biology of its unknown thrips host.

Description: Female (n=3, holotype and paratypes). Body slender, mostly dark brown except gena orange, tegula and seventh metasomal tergum light brown; antenna brown, legs brown to dark brown.

Head triangular in lateral view; vertexal suture angulate (broadly Y-shaped). Antenna (Fig. 36) inserted just above lower ocular line; scape slightly broadened medially, about 4.5 x as long as wide; pedicel long, about 2.6 x longer than wide, a little shorter than clava; both funicle segments longer than wide, F1 a little shorter and narrower than F2 and without sensilla, F2 with 1 sensillum; clava short, about 2.3 x as long as wide, its two segments subequal in length, with several sensilla.

Mesosoma much shorter than metasoma, almost smooth except pronotum and mesoscutum with faint cellulate sculpture; pronotum very long for the genus, a little broader than long; notauli faint but distinct, midlobe of mesoscutum with 2 pairs of setae. Wings much shorter than body. Forewing (Fig. 37) about 3.0 x as long as wide; longest marginal setae short, about 1/5 maximal width of forewing; disc hyaline, with numerous short setae, more or less uniformly setose behind and beyond base of marginal vein; postmarginal vein slightly shorter than stigmal vein. Hind wing about 7 x as long as wide; longest marginal setae about 3/4 its maximal width. Hind coxa faintly sculptured.

Petiole about 2 x wider than long. Ovipositor very long for genus, occupying about 3/4 length of gaster, markedly exserted beyond apex of gaster (by about 1/3 of its total length); ovipositor length/metatibia length ratio about 3.4:1; exserted part of ovipositor sheaths with numerous conspicuous setae (Fig. 38).

Measurements (n=1, holotype). Body: 1292. Antenna: scape: 127; pedicel: 79; F1: 39; F2: 44; clava: 88. Forewing: 658/215; longest marginal seta: 46. Hind wing: 615/85; longest marginal seta: 64. Ovipositor: 726.

Male. Unknown.

Holotype: Female on slide, labelled: 1. "29.21S 117.20E, 15 km N by E Mt. Singleton WA, 28-29 Sept. 1981 I. D. Naumann, J. C. Cardale"; 2. "caught in yellow tray; ex alcohol collection"; 3. "Mounted at UCR/ERM by V. V. Berezovskiy 2004 in Canada balsam. ANIC"; 4. "?genus nr *Ceranisus*" (in blue ink); 5. (red) "*Ceranisus barsoomensis* S. Triapitsyn HOLOTYPE ♀ [ANIC].

Paratypes: AUSTRALIA: *Western Australia*: same data as the holotype, 2♀ on points [ANIC, UCRC].

Hosts: Unknown.

Ceranisus planitianus Erdös, 1966

Thripoctenus kutteri Ferrière: Erdös 1956: 25 (misidentification).

Ceranisus sp.: Graham 1963: 270, 271.

Ceranisus planitianus Erdös, 1966: 408, 409. (Type locality: Szöd, Hungary)

Ceranisus planitianus Erdös: Boucek & Askew 1968: 138; Thuróczy 1992: 165; Loomans & van Lenteren 1995: 132, 196; Triapitsyn & Morse 2005: 72, 82, 83.

Diagnosis: This species was recently redescribed and illustrated (based on the North American specimens) by Triapitsyn and Morse (2005). Both sexes: similar to *C. menes* but entire body and coxae dark brown to black, appendages otherwise brown (scape slightly lighter). Malar sulcus split (Y-shaped) (Triapitsyn & Morse 2005). Female clava 2-segmented, not 3-segmented as mistakenly indicated by Erdös (1966). Male similar to female except for normal sexually dimorphic features; scape a little dilated medially, about 3 x as long as wide. Body entirely black, appendages dark brown.

Type material examined [HNHM]: Holotype female on card point, labelled: 1. "Szöd 1922 Biró VIII"; 2. "*Ceranisus planitianus* Erd. det. Erdös"; 3. "♀"; 4. "Typus"; 5. "Holotypus♀ *Ceranisus planitianus* Erd., 1966"; 6. "Hym. Typ. No. 5994 Mus. Budapest". Paratype male on point, labelled: 1. "Kalocsa 1943.v.28 Dr Erdös"; 2. "*Ceranisus planitianus* Erd. det. Erdös"; 3. "♂"; 4. "Paratypus"; 5. "Paratypus♂ *Ceranisus planitianus* Erd., 1966"; 6. "Hym. Typ. No. 5997 Mus. Budapest". 2 paratype males on points, labelled: 1. "Foktö 1943.vi.9 Dr Erdös"; 2. "*Ceranisus planitianus* Erd. det. Erdös"; 3. "♂"; 4. "Paratypus"; 5. "Paratypus♂ *Ceranisus planitianus* Erd., 1966"; 6. "Hym. Typ. No. 5998 Mus. Budapest".

Other material examined: ISRAEL: Arava Valley, 30°46.77'N:35°14.58'E, -116 m, 23.iii.1995, M.E. Irwin, 1♂ [UCRC]. MOLDOVA: Chisinau: 22.vii.1958, V. Talitsky, 1♀ (on dill, misidentified by Z. Boucek as *C. pacuvius*); 27.vii.1962, E.S. Sugonjaev, 1♀ (on dill, misidentified by E.S. Sugonjaev as *C. pacuvius*) [ZIN]. SPAIN: *Castellón*: Benicasim, 22–24.vi.1974, Z. Boucek, 1♂ (Det. Z. Boucek) [BMNH].

Distribution: Canada (Triapitsyn & Morse 2005), former Czechoslovakia (Loomans & van Lenteren 1995), Hungary, *Israel, *Moldova, Spain, and USA (Triapitsyn & Morse 2005).

Hosts: Unknown.

Comments: All positively identified females of this distinctive species from Europe that I have examined are dry-mounted on points.

Ceranisus menes (Walker, 1839)

Fig. 39

Pteroptrix Menes Walker, 1839: 18; Walker 1841: vi + pl. M, figs. 3 and 3a. (Type locality: near London, England, UK)

Thripoctenus russelli Crawford: Bagnall 1914: 531 (misidentification).

Thripoctenus brui Vuillet, 1914: 553, 554. Synonymised under *C. menes* by Boucek 1961: 26.

Epomphale auriventris Girault, 1915: 211. Synonymised under *C. menes* by Boucek 1988: 734.

Thripoctenus vinctus Gahan, 1932: 746, 747. **Syn. n.**

Thripoctenus brui Vuillet: Ishii 1933: 13–15, pl. I.

Epomphale rubensteina Girault, 1934: 3. Synonymised under *C. menes* by Boucek 1988: 734.

Euderomphale menes (Walker): Erdös 1956: 25.

Ceranisus menes (Walker): Graham 1959: 203; Boucek 1961: 26; Graham 1963: 203; Boucek & Askew 1968: 137; Trjapitzin 1978: 426; Boucek 1988: 734; Loomans & van Lenteren 1995: 99–115, 196; Triapitsyn & Headrick 1995: 233–235 (redescription of male and female, host associations), figs 9–12 (p. 244) and 20 (p. 247); Lacasa, Sánchez & Lorca 1996: 341–346, 348; Triapitsyn & Morse 2005: 72, 73.

Ceranisus rosilloi De Santis, 1961: 13–15. Synonymised under *C. menes* by De Santis & Fidalgo 1994: 89, 90.

Ceranisus brui (Vuillet): Yoshimoto 1965: 690.

Ceranisus vinctus (Gahan): Baltazar 1966: 112; Loomans & van Lenteren 1995: 125–127, 196.

Ceranisus russelli (Crawford): Valentine 1967: 1124 (misidentification).

Ceranisus russeli [sic] Crawford: Boucek & Askew 1968: 138 (mistakenly indicated for the Palaearctic region).

Diagnosis: Female and male, see Triapitsyn and Headrick (1995). Vertexal suture straight and complete. Male genitalia as in Fig. 39.

Type material examined: Lectotype female of *Pteroptrix menes* Walker on card [BMNH], labelled: 1. “*Menes*”; 2. “Lectotype”; 3. “Lectotype”; 4. “*Ceranisus menes* (Walk.) LECTOTYPE♀ Graham det. 68”; 5. “B. M. Type Hym 5.2713”. The lectotype is in fair condition. Paralectotype female on card [BMNH], labelled: 1. “$4^{38}5$”; 2. “Paralectotype”; 3. “Great Britain”; 4. “*Pteroptrix menes* Walker”.

Holotype female of *Thripoctenus vinctus* Gahan on slide [USNM], labelled: 1. “*Thripoctenus vinctus*. n. sp. Ex. thrips ?*Hereothrips* [sic] *fasciatus* Laguna, P. I. 1931 D. T. Fullaway, coll. Hoyer mount 7157/Hm [i.e., Hymenoptera lot]”; 2. (red) “*Thripoctenus vinctus* Gahan♀ Type Type No.43919 U.S.N.M.”. The holotype was remounted at UCRC in 2000 into Canada balsam because the Hoyer’s mountant on the original slide was all dry and the specimen was in danger and not visible. After remounting, it consists of several more or less fairly preserved parts (i.e., head with parts of the antennae attached, the remainder of the body with 2 pairs of legs and one forewing attached, hind pair of legs and the rest of wings are detached from the body; flagellum of one antenna and F2 and clava of the other antenna are missing). Paratypes of *T. vinctus* [USNM], as follows: 7♀ on 6 slides (5 of them were remounted at UCRC in 2000 on to individual slides in Canada balsam from Hoyer’s original mounts on 4 slides) and 3♀ on points (badly shrivelled), all from Laguna, the Philippines, collected by D.T. Fullaway in 1931, also labelled “Ex. thrips” (from the same series as the holotype) except for 3♀ on slides labelled “on window in laboratory”.

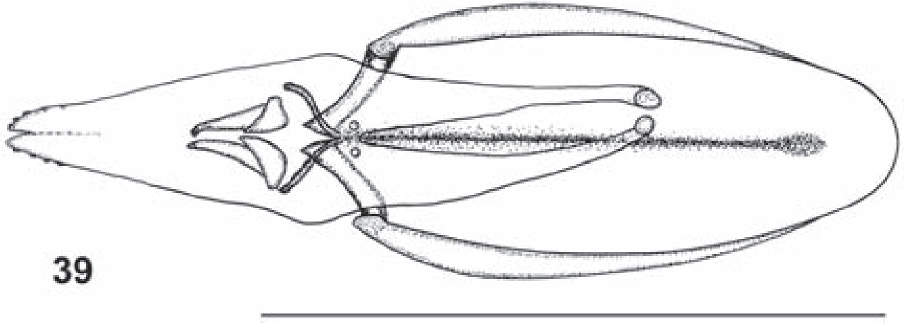


Fig. 39. *Ceranisus menes*, male genitalia (Wageningen, Netherlands, originally from Los Baños, Luzon Island, Philippines). Scale line = 0.1 mm.

Holotype female of *Ceranisus rosilloi* De Santis on slide [MLPA], labelled: 1. "*Ceranisus rosilloi* Det. De Santis Holotipo 1924 Museo de La Plata"; 2. "Tezanos Pinto (Prov. de Entre Rios) Col: Rosillo 1957 HOLO No 15 (Rosillo)". Also examined were 10 female paratypes of *C. rosilloi* on individual slides [MLPA], same label data as the holotype except the following collection dates: 8.ii.1957 (on 1 slide, marked as "Trébol rojo y trébol blanco" [red and white clover]); 6.ix.1957 (on 1 slide); and 18.x.1957 (on 3 slides).

Other material examined: AUSTRALIA: *New South Wales*: Blue Mountains National Park, Gorge Track, 16.iv.1994, S. Goodwin, M. Steiner, 3♀ ("on *Acacia ?terminalis*") [ANIC]. Monga State Forest, 1.ii.1984, L. Masner, 1♀ [CNCI]. S of Morpeth, 15.i.1995, M. Steiner, S. Goodwin, 2♀ ("Assoc. with thrips on lucerne", det. I.D. Naumann, 1995). E of Rankins Springs, 1.x.1994, M. Steiner, S. Goodwin, 2♀ ("Assoc. with thrips on acacia"). Young District, 45 km from Boorowa, 12.x.1994, M. Steiner, S. Goodwin, 4♀ 2♂ ("Assoc. with thrips on cherry", females det. by I.D. Naumann, 1995). *Northern Territory*: Darwin, 17.ix.1994, M. Steiner, S. Goodwin, 1♀ ("Assoc. with thrips on mango", det. I.D. Naumann, 1995) [ANIC]. *Queensland*: Acacia Ridge, Brisbane, 19.ix.1977, E.C. Dahms, 1♂ [QMBA]. Biggenden, ca. 32 km SE Munna Creek, 24.ix.1995, J.D. Pinto, 4♀. Blackbutt Creek, 9 km E Blackbutt, 22.ix.1995, J.D. Pinto, 27♀ [UCRC]. 16 km N Boonah, 27°54'S:152°41'E, 17.ii.1996, C.J. Burwell, 45♂. 7.2 km SE Chillagoe, 17°12'21"S:144°32'55"E, 20.iii–2.iv.1992, E.C. Dahms, G. Sarnes, 1♀ 1♂. 2 km W Chinchilla, 25.iii–10.iv.1987, G. Lithgow, 1♀. Cootharaba Lake near Gympie, 13.xi.1976, Z. Boucek, 1♀ (det. Z. Boucek, 1982). 10 km NW Ellis Beach, 16°40'S:145°34'E, C.J. Burwell: 8.vi.1996, 1♂; 20.iv.1997, 1♀. Emu Creek, 2 km NE Petford, 17°20'S:144°57'E, 26.iv.1997, C.J. Burwell, 1♀ 1♂ [QMBA]. Gatton: v.1980, J.S. Noyes, 1♂ (det. Z. Boucek, 1982) [ANIC]; 2.x.1985, B.E. Arsson, 1♀ (in mandarin flower) [UCRC]. Home Rule, 2.5 km W Rossville, 15°45'S:145°17'E, 11.vi.1996, C.J. Burwell, 2♂. 9 km N Kumbarilla, 27°14'S:150°53'E, 2.iv.1996, C.J. Burwell, 2♂. Mahogany Forest, Mt. Mofflatt National Park, 24°56'S:148°04'E, 1200 m, 24–26.ii.1996, C.J. Burwell, 1♂ [QMBA]. Main Ridge National Park, Cunninghams Gap, 28°03.01'S:152°23.59'E, 9.xii.2002, A. Owen, J. George, J. Munro, 1♂ [UCRC]. 3 km NE Mareeba, 17°00'S:145°24'E, 25–28.xi.1997, C.J. Burwell, 1♂. Mt. Glorious: vi.1982–v.1983, A. Hiller, 1♀ 6♂. 17.x.1990, E.C. Dahms, G. Sarnes, 1♀. 27°21'S:152°45'E, 11.iii.1998, C.J. Burwell, 1♀ [QMBA]. Mt. Tibrogargan, 5.v.1980, J.S. Noyes, 1♀ (det. Z. Boucek, 1982) [ANIC]. Mundubbera, vi.2000, C. Freebairn, 1♂ [UCRC]. 1 km N Rounded Hill near Hope, Vale Mission, 5–6.x.1994, J.C. Cardale, 1♀ [ANIC]. Windsor Tableland, 16°15'S:145°01'E, 24.xi.1997, C.J. Burwell, 1♂ [QMBA]. *Western Australia*: 25 km N Muchea, 19.x.1994, M. Steiner, S. Goodwin, 1♀ ("Assoc. with thrips") [ANIC]. BULGARIA: Küleftse [sic], 1928, L. Biró, 1♀ [HMNH]. DEMOCRATIC REPUBLIC OF THE CONGO: Lwiro River, 47 km N Bukavu, 1650 m., 4.i.1958, E.S. Ross, R.E. Leech, 2♀ [CAS]. ENGLAND: *Devonshire*: nr Ilfracombe, Hele Bay, viii.1913, R.S. Bagnall, 2♀ (original label: "Chalcid *Thripoctenus* nr Ilfracombe, VIII/13, on *Linaria* with *Taeniothrips [Physothrips] primulae*, etc. R.S. BAGNALL"). *Oxfordshire*: nr Oxford, Hogley Bog, VIII.1913, R.S. Bagnall, 1♀ (original label: "Chalcid *Thripoctenus* from *Pedicularia palustris* with var. thrips Hogley Bog, nr Oxford, VIII/13 R.S. BAGNALL") [BMNH]. FRANCE: *Gironde*: Sainte Colombe, 44°54'N:00°02'W: 13.viii.1998, M. van Helden, 1♀; 17.viii.2000, M. van Helden, 13♀ [UCRC]. *Hérault*: Grabels, 8.ix.1979, J.T. Huber, 2♀. Montpellier, 7.ix. and 25–28.ix.1979, J.T. Huber, 11♀ [CNCI]. St. Matthew-Trev., 43°45'38"N:3°51'58"E, 29.vi.2000, S.V. Triapitsyn, 1♀ [UCRC]. HUNGARY: nr Budapest, Nagykovácsi, 31.viii.1987, G. Jenser, 1♀ (associated with ?*Odontothrips meliloti* Priesner on *Melilotus alba* according to Thuróczy & Jenser (1996), as *C. pacuvius*). Dombóvár, 17.vii.1943, J. Erdös, 1♀ (det. G. Szelényi). Foctö, J. Erdös: 9.vi.1943, 2♀; 17.viii.1943, 2♀ [HNHM]. INDIA: *Karnataka*: Bangalore, 4.xii.1974, 2♀ [CNCI]. *Uttar Pradesh*: Aligarh, 30.xi.2003, J.M. Heraty, 1♀ 1♂ [UCRC]. INDONESIA: Bali Island, Panulisan, 21.xi.1978, 2♀ 1♂ [CNCI]. ITALY: *Roma Prov.*: Lazio, Castel Porziano Presidential Estate, 41°46.670'N:12°24.751'E, 30 m, 11–12.VI.2003, M. Bologna, J. Munro, A. Owen, J. Pinto, 3♀, 2♂ [UCRC]. JAPAN: *Shimane Pref.* (Honshu Island): Izumo, 24.vii.1988, T. Murai, 4♀ (lab. culture on *Frankliniella intonsa* (Trybom)) [HFES]. KENYA: Kaimosi Mission, 27 mi. NE Kisumu, 1650 m, 29.xi.1957, E.S. Ross, R.E. Leech, 1♀ [CAS]. Kakamega District, Isecheno Nature Reserve, 0.24°N:34.87°E, 1800 m, R.R. Snelling: 1–10.ii.2002, 1♀. 1–20.iii.2002, 3♀ 1♂ [UCRC]. Meru, 28.vii.1997, Gitonga, 6♀ (ex. thrips on bean) [BMNH, UCRC]. MALAYSIA: *Selangor*: Kuala Lumpur, University of Malaya, Rimba Ilma, 100 m, 14.vi.1990, J.M. Heraty, 1♀ (on *Garcinia* sp.). University of Malaya Forest Study Center, 16 mi. E Gombak, 300 m, 15–24.vi.1990, J.M. Heraty, 1♀ 7♂ [UCRC]. MOLDOVA: nr Grigoriopol', Karmanovo, 2–12.vii.1961, Z. Boucek, 2♀. Chisinau, 12.vii.1958, V. Talitsky, 1♀ (on dill). Kotovskoye: 29.vi.1960, V. Talitsky, 1♀; 12.vii.1961, Z. Boucek, V. Talitsky, 1♀. Strasheny, 21.x.1961, Z. Boucek, V. Talitsky, 1♀ [ZIN]. NETHERLANDS: Wageningen, 1991, A. Loomans, 3♂ ("F1 of lab. culture on *Frankliniella schultzei* (Trybom), orig. from the Philippines, Luzon Island, Los Baños, 30.iv.1991, M. Tamò, ex. *Megaleurothrips usitatus* on *Cajanus cajan*") [BMNH, UCRC]. NEW ZEALAND: Auckland, Waterview, 2.xii.1999, K.J. Froud, 3♀ ("ex. *Thrips tabaci* on foxglove leaves"). PAPUA NEW GUINEA: *Central Prov.*: 15 km SE Port Moresby, 1.i.1986, G. Gordh, 2♀ [UCRC]. PHILIPPINES: Luzon Island, Laguna, 1931, I. Dobrosky, 13♀ ("Parasite of *Taeniothrips longistylus* K. [Karny] coll. in bean fls. [flowers]" [USNM]. REPUBLIC OF KOREA: Suwon-si, Seodun-dong, Yeogisan, 7.x.1997, J.-Y. Choi, 3♀, 1♂ [UCRC].

RUSSIA: *Krasnodarskiy Krai*: nr Krasnodar, All Russian Research Institute of Biological Plant Protection, 11–12.viii.2001, V.V. Kostjukov, 1♀. *Moscow Region*: Pushkino District, Mamontovka, 19.vii.1986, V.A. Trjapitzin, 2♀ [ZIN]. *Primorskiy Krai*: Ussuriysk District, Gornotayozhnoye, 21–22.vi.1999, M. Michailovshaya, 1♂ [UCRC]. Vladivostok, viii.1983, V.A. Trjapitzin, 1♀. Near Vladivostok (11 km), vii.1986, V.A. Trjapitzin, 1♀ [ZIN]. SRI LANKA: Mt. Lavinia, 6°50'N:79°52'E, 13.iii.1999, C.J. Burwell, 1♂. Sigiriya, 7°57'N:80°46'E, 20.iii.1999, C.J. Burwell, 1♂ [QMBA]. TAIWAN (CHINA): *Nantou Hsien*: Sun Moon Lake, Tehuache, 800–900 m, 6.vi.1990, J.M. Heraty, 2♀. Tungpu, 1200 m, 1.vi.1990, J.M. Heraty, 1♀. THAILAND: Bangkok, Bangkhen, 23.i.1988, M. Takagi, S. Okajima, 1♀ (ex. *Thrips palmi* Karny); 5.ii.1988, M. Takagi, 1♀ 1♂ (ex. *T. palmi*). *Lamphun*: Mueang, Bang Muang Nga, 9.ii.1988, Y. Hirose, K. Takasu, 1♂ (ex. *T. palmi*) [UCRC]. *Nonthaburi*: Bang Bua Thong, 15.ii.1988, Y. Hirose, K. Takasu, 2♂ (ex. *T. palmi*). TURKEY: Kemer, 14–20.v.1991, J. LaSalle, 10♀ [BMNH].

Distribution: Cosmopolitan (Loomans & van Lenteren 1990, 1995; Triapitsyn & Headrick 1995; Triapitsyn & Morse 2005).

Hosts: Various Thripidae. For detailed lists of the hosts of *C. menes* see Loomans and van Lenteren (1995). *Scirtothrips citri* (Moulton) and *S. perseae* Nakahara were added recently to that list (Triapitsyn & Morse 1999 and 2005, respectively).

Comments: Females of this species may have either a yellow or partly brown metasoma, and usually colouration appears to be consistent among the individuals collected from a given location. Triapitsyn and Headrick (1995) as well as Loomans (2003) discussed this aspect in detail. But the lectotype of *C. menes* has a partially brown (in its distal half) metasoma whereas that of the paralectotype is completely yellow. In many countries this species is represented by females only; males are common in the Australian and Oriental regions.

The specimens from England (UK), misidentified by R.S. Bagnall as *T. russelli* (Bagnall 1914), were remounted by me into Canada balsam from a completely black medium of unknown nature on slides, in which all but a few body parts were dissolved; the remaining parts of a forewing made possible identification of these specimens as *C. menes*.

As correctly predicted by Loomans and van Lenteren (1995), *C. vinctus* turned out to be an obvious junior synonym of *C. menes*.

Ceranisus udnamtak sp. n.

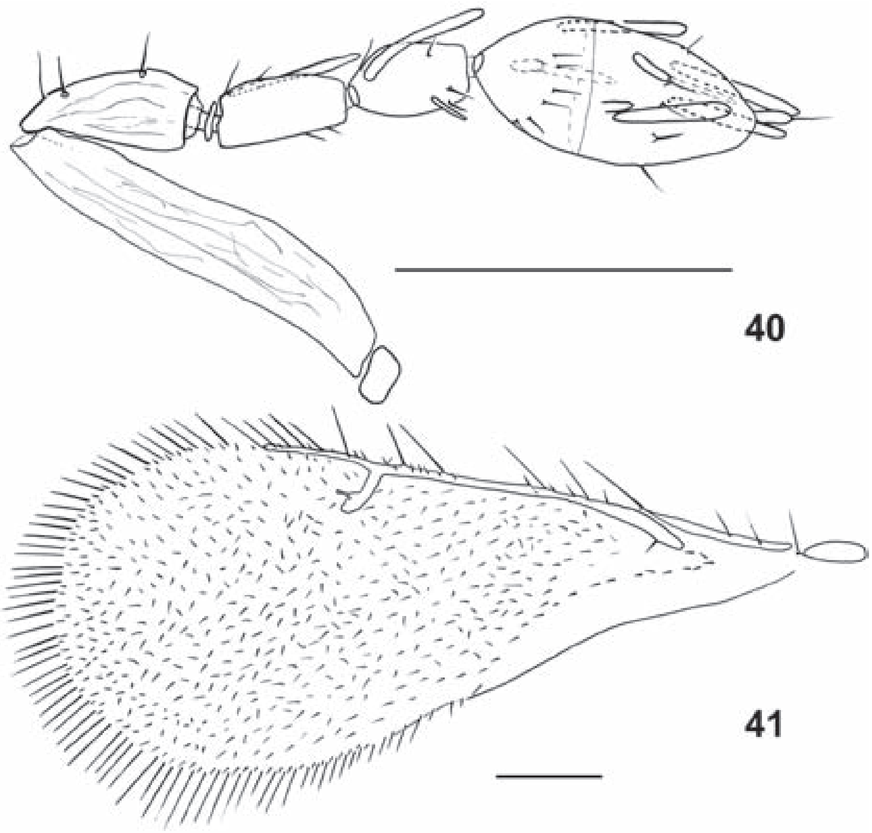
Figs 40, 41

Etymology: The specific name is a reversed spelling of the type locality, Katmandu.

Diagnosis: This species is easily recognisable from all other described species of *Ceranisus* by the unique combination of the following morphological characters: F1 of female antenna much longer than broad, a little longer than F2; forewing with a very long postmarginal vein (much longer than stigmal vein) and a distinct bare area along posterior margin behind base of marginal vein, demarcated anteriorly by a sinuate row of setae; and a yellow metasoma. It is somewhat similar to female of *C. menes* with a completely yellow metasoma, from which female of *C. udnamtak* can be easily distinguished using the characters indicated in the key above.

Description: Female (holotype). Head and mesosoma brown, metasoma and appendages yellow or very light brown.

Antenna (Fig. 40) with scape slender, 5.25 x as long as wide; pedicel a little longer than F1; funicle long, F1 much longer than wide, a little longer than F2 and with 1 sensillum, F2 slightly wider than F1 and also with 1 sensillum; clava slightly longer



Figs 40, 41. *Ceranisus udnamtak* sp. n., female (holotype): (40) antenna, (41) forewing. Scale lines = 0.1 mm.

than funicle, 2.0 x as long as wide, its distal segment about 1.5 x longer than basal claval segment, both with several sensilla.

Mesosoma almost as long as metasoma; pronotum, mesoscutum, scutellum, and axillae with faint cellulate sculpture; midlobe of mesoscutum with 2 pairs of setae. Forewing (Fig. 41) about 2.5 x as long as wide; longest marginal setae 1/4 maximal width of forewing; disc hyaline, with numerous, short setae, more or less uniformly setose behind and beyond base of marginal vein except for a conspicuous bare area along posterior margin behind base of marginal vein, demarcated anteriorly by a notably sinuate line of setae; postmarginal vein very long, much longer than stigmal vein. Coxae faintly sculptured.

Ovipositor occupying 0.65 length of gaster, not exserted; ovipositor length/metatibia length ratio about 1.2:1.

Measurements (n=1, holotype). Body: 916. Antenna: scape: 127; pedicel: 55; F1: 42; F2: 38; clava: 85. Forewing: 736/291; longest marginal seta: 70. Ovipositor: 270.

Male. Unknown.

Holotype: Female on slide, labelled: 1. “NEPAL: Katmandu, 4500 ft., 19-XI-1961, E. S. Ross, D. Q. Cavagnaro Cal. Acad. Sci. Coll. Canada balsam, Cal. Acad. Sci. Coll.”; 2. (red) “*Ceranisus udnamtak* S. Triapitsyn HOLOTYPE ♀ ”. [CAS].

Host: Unknown.

Comments: The holotype specimen is slide-mounted rather poorly (laterally, with both hind wings folded); flagellum of one antenna is missing.

Ceranisus votetoda sp. n.

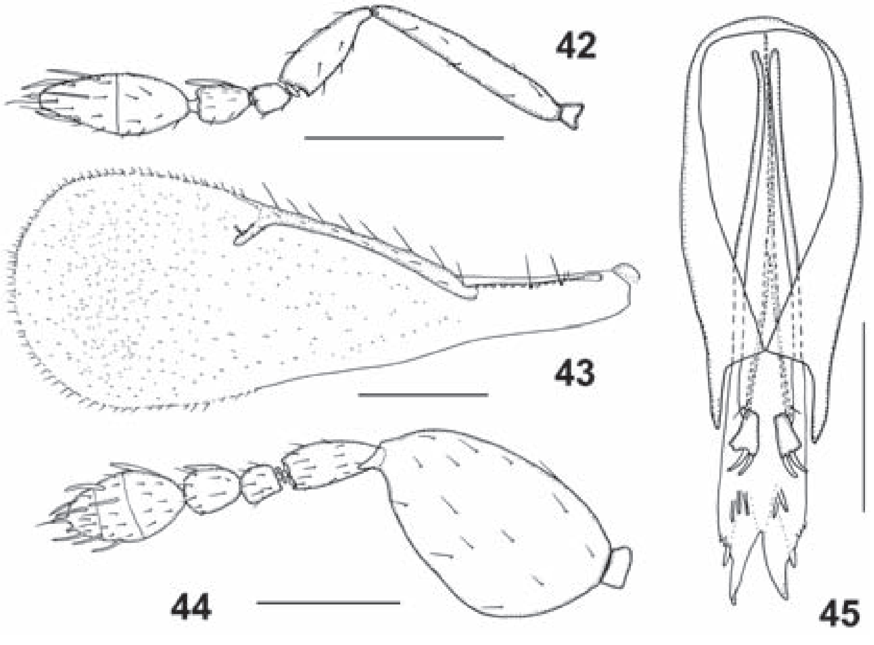
Figs 42–45

Etymology: “Vot eto da” stands for “wow” in Russian.

Diagnosis: This species seems to be unrelated to *C. pacuvius* but in some regards is rather more similar to *C. barsoomensis* sp. n. (in having an elongated body, a long pronotum, and very short wings) and also to *C. femoratus* (in having a somewhat similar chaetotaxy on the forewing and a short ovipositor). All three species (*C. votetoda* sp. n., *C. barsoomensis* sp. n., and *C. femoratus*) have an angulate, broadly V or Y-shaped vertexal suture. Female of *C. votetoda* sp. n. can be easily distinguished from that of *C. barsoomensis* sp. n. by a much shorter ovipositor and different proportions of funicle segments, and from female of *C. femoratus* by a very small F1 without sensilla, a much longer pronotum, and much shorter marginal setae on the forewing.

Description: Female (holotype). Body slender; general body colour brown, appendages light brown.

Vertexal suture angulate (broadly Y-shaped). Antenna (Fig. 42) with scape slender, about 6 x as long as wide; pedicel a little longer than funicle; funicle short, F1 notably smaller than F2 and without sensilla, F2 with 1 sensillum; clava about 2.4 x as long as wide, its two segments subequal in length, with several sensilla.



Figs 42–45. *Ceranisus votetoda* sp. n.: (42, 43) female (holotype): (42) antenna, (43) forewing; (44, 45) male (paratype): (44) antenna, (45) genitalia. Scale lines = 0.1 mm.

Mesosoma almost as long as metasoma; pronotum, mesoscutum, scutellum, and axillae with faint cellulate sculpture; pronotum very long for the genus (about as long as scutellum); notauli indistinct, faintly marked by change in sculpturing; midlobe of mesoscutum with 2 pairs of setae. Forewing (Fig. 43) 2.6–2.7 x as long as wide; longest marginal setae very short, less than 1/10 maximal width of forewing; disc hyaline, with numerous, very short setae, more or less uniformly setose behind and beyond base of marginal vein except for a narrow bare area along posterior margin behind base of marginal vein (this bare area not as prominent as in *C. menes*, the line of hairs demarcating it just a little sinuate); postmarginal vein about as long as stigmal vein. Hind wing about 8 x as long as wide; longest marginal setae equal to wing's maximal width. Fore- and hind coxae faintly sculptured.

Petiole much wider than long. Ovipositor occupying about 3/5 length of gaster, not exserted; ovipositor length/metatibia length ratio about 1.4:1.

Measurements (n=1, holotype). Body: 867. Antenna: scape: 109; pedicel: 55; F1: 20; F2: 28; clava: 70. Forewing: 500/188; longest marginal seta: 16. Hind wing: 425/55; longest marginal seta: 55. Ovipositor: 221.

Male. Body larger and darker (dark brown, with appendages brown to light brown), with shorter pronotum, and also wings notably broader than in female; otherwise similar to female except for normal sexually dimorphic features, as follows. Antenna (Fig. 44) with scape strongly dilated, smooth, about 1.7 x as long as wide; funicle as in female, clava compact, a little longer than funicle, about 1.7 x as long as wide. Genitalia as in Fig. 45.

Holotype: Female on slide, labelled: 1. "29.21S 117.20E, 15 km N by E Mt. Singleton WA, 28-29 Sept. 1981 I. D. Naumann, J. C. Cardale"; 2. "caught in yellow tray; ex alcohol collection"; 3. "Mounted at UCR/ERM by V. V. Berezovskiy 2004 in Canada balsam. ANIC"; 4. (red) "*Ceranisus votetoda* S. Triapitsyn HOLOTYPE ♀ " [ANIC].

Paratype: AUSTRALIA: *Western Australia*: same data as the holotype, 1♂ on slide (also labelled as "♂ *Ceranisus* nr *pacuvius* Walk. det. Z. Boucek, 1986") [ANIC].

Host: Unknown.

Ceranisus americensis (Girault, 1917)

Thripoctenus americensis Girault, 1917*c*: 448. (Type locality: Salt Lake City, Utah, USA)
Ceranisus americensis (Girault): Peck 1963: 117; Loomans & van Lenteren 1995: 123, 125, 196; Triapitsyn & Headrick 1995: 236, 237, 245, 247, 248 (designation of the lectotype and paralectotypes, redescription, illustrations of the female); Triapitsyn & Headrick 1996: 168–170 (description and illustrations of the male); Triapitsyn & Morse 2005: 74, 75.

Diagnosis: Female. See Triapitsyn and Headrick (1995).

Male. See Triapitsyn and Headrick (1996).

Material examined: Lectotype female and numerous paralectotype females in USNM (Triapitsyn & Headrick 1995).

Distribution: Argentina (Triapitsyn & Morse 2005), Canada (Triapitsyn & Headrick 1995), Costa Rica, Guatemala, Mexico (Triapitsyn & Morse 2005), Panama (Sakai 2001), and USA; introduced into the Netherlands (Loomans & Pákozdi 1996; Loomans 2003).

Hosts: Mainly *Frankliniella occidentalis* (Pergande) (Loomans & van Lenteren 1995; Triapitsyn & Headrick 1995); also was artificially reared on several other species of Thripidae (Loomans & van Lenteren 1995; Loomans & Pákozdi 1996).

Ceranisus nigrifemora De Santis, 1961

Ceranisus nigrifemora De Santis, 1961: 16–19. (Type locality: Reserva Forestal, Tucumán, Argentina)
Ceranisus nigrifemora De Santis: Loomans & van Lenteren 1995: 130, 196; Triapitsyn & Morse 2005: 75, 76, 83.

Diagnosis: This species was well illustrated by De Santis (1961) and also recently redescribed and illustrated by Triapitsyn and Morse (2005). It is very similar to the large-bodied specimens of *C. americensis* from North America mentioned by Triapitsyn and Headrick (1995), which have a sensillum on F1 of the female antenna (in that case F1 is a little longer than the usually very small F1 in the more common smaller-bodied specimens of *C. americensis*). Colour of the femora (dark brown in *C. nigrifemora* but light in *C. americensis*) is used to separate these two apparently closely related taxa in the key.

Material examined: Holotype female on slide [MLPA], labelled: 1. "*Ceranisus nigrifemora* Det. De Santis HOLOTIPO 1925 MUSEO DE LA PLATA"; 2. "Reserva Forestal (Prov. de Tucumán) Col: Exp. Museo 12/III/1960". Allotype male and paratype male on separate slides [MLPA], same label data as the holotype.

Distribution: Argentina and Venezuela (Triapitsyn & Morse 2005).

Hosts: Unknown.

Ceranisus femoratus (Gahan, 1932)

Figs 46–48

Thripoctenus femoratus Gahan, 1932: 747, 748. (Type locality: Laguna, Luzon Island, Philippines)
Ceranisus femoratus (Gahan): Baltazar 1966: 112; Loomans & van Lenteren 1995: 130, 196.

Diagnosis: Superficially, this species can be confused with some *C. menes* (those which have distal metasomal terga brown). Unlike *C. menes,* basal metasomal terga are completely brown to dark brown in *C. femoratus* (yellow to light brown in *C. menes*); also the vertexal suture is notably angulate in *C. femoratus* (straight in *C. menes*).

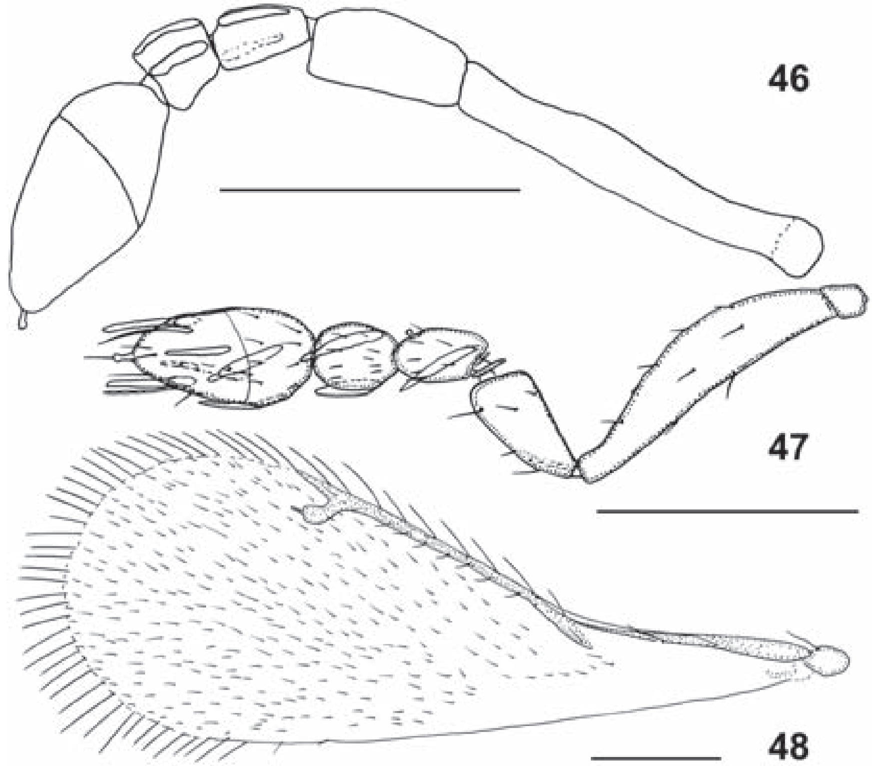
Redescription: Female (n=2, holotype and specimen from Hyderabad, India). Body, coxae, and femora dark brown, basal metasomal terga sometimes a little, but not contrastingly, lighter (brown); antenna, tibiae and tarsi pale to light brown.

Vertexal suture angulate (broadly Y-shaped). Antenna (Figs 46, 47) with scape slightly broadened medially, about 4.4 x as long as wide; funicle segments subequal, F1 a little longer than wide and with 1 or 2 sensilla, F2 as long as wide and with 2 sensilla; clava about 1.7 x as long as wide, its distal segment about 2 x as long as basal claval segment.

Mesosoma shorter than metasoma, almost smooth; midlobe of mesoscutum with 2 pairs of setae. Forewing (Fig. 48) about 2.4 x as long as wide; longest marginal setae about 1/4 maximal width of forewing; disc hyaline, with numerous short setae, more or less uniformly setose beyond base of marginal vein except for a narrow bare area along posterior margin behind base of marginal vein (this bare area not as prominent as in *C. menes*, cubital setal line demarcating it just a little sinuate); postmarginal vein slightly longer than stigmal vein. Hind wing about 6 x as long as wide; longest marginal setae about 0.7 x its maximal width. Coxae and femora with faint cellulate sculpture.

Petiole about 2 x wider than long. Ovipositor occupying 3/5–7/10 length of gaster, not or barely exserted; ovipositor length/metatibia length ratio about 1.6:1.

Measurements (n=1, holotype). Body: about 1100. Antenna: scape: 121; pedicel: 50; F1: 27; F2: 27; clava: 73. Forewing: 576/239; longest marginal seta: 58. Hind wing: 539/86; longest marginal seta: 61. Ovipositor: 300.



Figs 46–48. *Ceranisus femoratus*, female: (46) antenna (holotype), (47) antenna (Hyderabad, India), (48) forewing (holotype). Scale lines = 0.1 mm.

Male. Unknown.

Type material examined: Holotype female on slide [USNM], labelled as follows: 1. (red) "*Thripoctenus femoratus* Gahan♀ Type Type No. 43920 U.S.N.M."; 2. "*Thripoctenus* Ex thrips Laguna, P.i. 1931 D. T. Fullaway, coll. KOH - Hoyer mount Hym. lot 7157". Despite what is indicated on the label, the holotype specimen is uncleared and mounted in Canada balsam; the head is crushed and one antenna (except for the scape) is detached.

Other material examined. CAMEROON: M'balmayo, v.1998, M. Tamò, 3♀ (ex. *Megalurothrips sjostedti* (Trybom)). INDIA: *Andhra Pradesh*: Hyderabad, iv.1997, M. Tamò, 1♀ (in flowers of *Pongamia glabra*) [UCRC].

Distribution: Benin (introduced), Cameroon, India, ?*Kenya (see comments below), and the Philippines.

Hosts: ?*Megalurothrips usitatus* Bagnall (by association only, as *Taeniothrips longistylus* Karny) (Gahan 1932) and *M. sjostedti* (Trybom). *C. femoratus* was successfully introduced from Cameroon to Benin against *M. sjostedti* (Tindo 2001); also attempts were made to introduce it to Ghana (Tamò *et al.* 2003).

Comments: A very similar form, but slightly differing from other specimens of *C. femoratus* in the colour of gaster (all brown) and legs (all pale except for the coxae) was collected from bean flowers in Meru, Kenya, in February 1997 by S. Michalik (3 females in UCRC, material sent by M. Tamò, initially misidentified by me as *C. menes*). Most likely it is just a mere colour form of *C. femoratus*.

Ceranisus antalyacus S. Triapitsyn, 2004

Ceranisus antalyacus S. Triapitsyn *in* Cameron *et al.*, 2004: 378–381. (Type locality: About 30 km from Antalya on road to Korkuteli, Turkey)

Diagnosis: Among the Palaearctic species of *Ceranisus*, female and male similar to those of *C. pacuvius* but in *C. antalyacus* the basal segment of antennal clava is longer than the distal segment; scape of male antenna is lightly, but notably sculptured in *C. antalyacus* (practically smooth and more swollen in *C. pacuvius*). For the detailed description and illustrations of both sexes of this species see Cameron *et al.* (2004).

Material examined: Holotype female [USNM] and female and male paratypes in UCRC and other collections (Cameron *et al.* 2004).

Distribution: Turkey (Antalya).

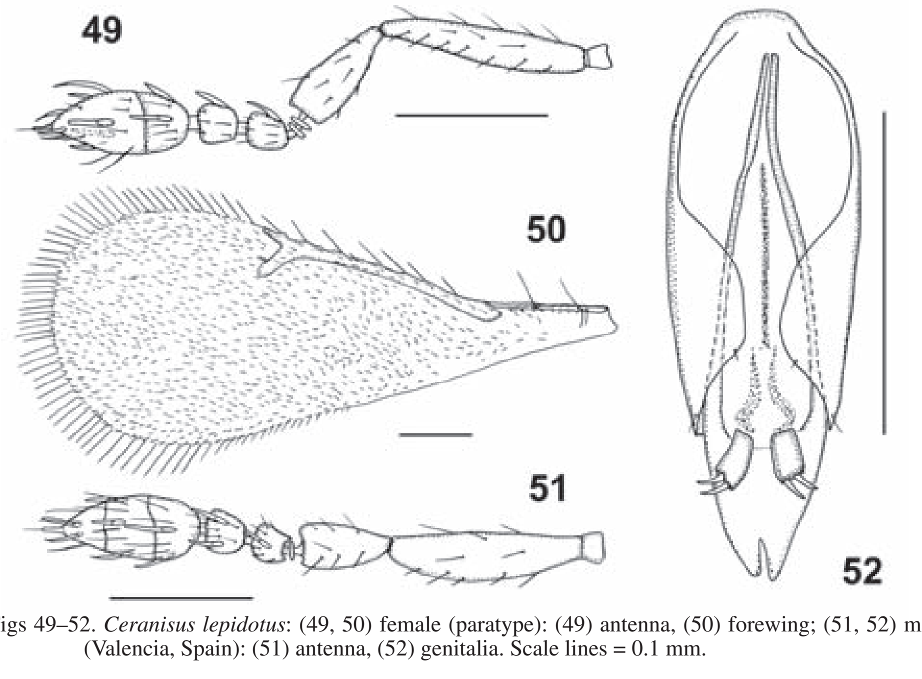
Hosts: ?*Taeniothrips inconsequens* (Uzel) and possibly other thrips species (Cameron *et al.* 2004).

Ceranisus lepidotus Graham, 1963

Figs 49–52

Ceranisus lepidotus Graham, 1963: 271, 272. (Type locality: Britain, unlocalized [sic] (Graham 1963))
Ceranisus lepidotus Graham: Boucek & Askew, 1968: 137; Loomans & van Lenteren 1995: 130, 196; Lacasa, Sánchez & Lorca 1996: 341–345, 347, 348.

Diagnosis: As noted by Graham (1963), this species somewhat resembles *C. pacuvius* (especially chaetotaxy of the forewing) but yet its both sexes can be easily distinguished from those of *C. pacuvius* by the obvious metallic green colouration of the dorsum of head and mesosoma, which are also much strongly sculptured in *C. lepidotus*. Also in



Figs 49–52. *Ceranisus lepidotus*: (49, 50) female (paratype): (49) antenna, (50) forewing; (51, 52) male (Valencia, Spain): (51) antenna, (52) genitalia. Scale lines = 0.1 mm.

C. lepidotus, F1 is about as long as wide in both sexes and male scape is relatively slender, whereas in *C. pacuvius* F1 is clearly longer than wide and male scape is strongly swollen. The forewing of *C. lepidotus* is relatively wider and its marginal setae are relatively shorter than those of *C. pacuvius*.

Redescription: Female (n=1, paratype). Body and appendages dark brown except head and mesosoma dark metallic green dorsally, basal metasomal terga just a little, but not contrastingly, lighter (brown); head, mesosoma, coxae, and femora with variable reticulate sculpturing.

Vertexal suture slightly sinuate. Antenna (Fig. 49) with scape slightly broadened medially and notably narrowed distally, about 4.8 x as long as wide; pedicel longer than funicle; both anelli conspicuous; funicle segments subequal, about as long as wide (F2 more quadrate than F1), each with 1 sensillum; clava about 2.1 x as long as wide, its distal segment 1.7–2.0 x as long as basal claval segment.

Mesosoma about as long as metasoma; midlobe of mesoscutum with 2 pairs of setae. Forewing (Fig. 50) about 2.5 x as long as wide; longest marginal setae about 1/5 maximal width of forewing; disc hyaline, uniformly covered with numerous setae; submarginal vein with 2 hypochaetae opposite to proximal dorsal macrochaeta, postmarginal vein a little shorter than stigmal vein. Hind wing 6.3 x as long as wide; longest marginal setae about 4/5 its maximal width; disc hyaline, uniformly covered with numerous setae.

Petiole about 1.8 x wider than long. Ovipositor short, occupying about 3/5 length of gaster, not exserted; ovipositor length/metatibia length ratio 2.0:1.

Measurements (n=1, paratype). Body: about 1000. Antenna: scape: 138; pedicel: 75; F1: 27; F2: 27; clava: 91. Forewing: 812/326; longest marginal seta: 64. Hind wing: 720/115; longest marginal seta: 94. Ovipositor: 249.

Male (description, hitherto unknown). Similar to female except for normal sexually dimorphic features and the following. Antenna (Fig. 51) with scape short (about 3.6 x as long as wide), just a little dilated medially, notably longitudinally striate; F1 slightly narrower than F2 and with 1 sensillum, F2 with 2 sensilla; clava 3-segmented as normal for the genus, about 2.0 x as long as wide. Submarginal vein of forewing with 3 hypochaetae opposite to proximal dorsal macrochaeta. Genitalia as in Fig. 52.

Type material examined: Paratype female on point [BMNH], labelled: 1. "Wytham Wood, BERKS, (1)21.6.1952, M. W. Graham."; 2. "near *clavicornis* sec. Type in coll. Thomson"; 3. "PARATYPE"; 4. "*Ceranisus lepidotus* sp. n. M. de V. Graham det. 1963 Paratype♀". This badly shriveled specimen was then remounted onto a slide in Canada balsam at UCRC, and that enabled its detailed study and also made possible drawing the illustrations.

Other material examined: SPAIN: Valencia, 5.vi.1991, 1♂ ("ex. *Diplotaxis erucoides* Univ. Politer, Valencia, coll. 327-16, IIE 2181. *Ceranisus lepidotus* Graham Det. J. LaSalle, 1991") [BMNH].

Distribution: Great Britain (an unspecified location) (Graham 1963) as well as England (UK) and Spain.

Hosts: Found in association with various thrips species (Lacasa, Sánchez & Lorca 1996) but not reared from any of them, although *C. lepidotus* was observed parasitising larvae of *Frankliniella occidentalis* (Pergande) and *Limothrips cerealium* (Haliday) (Lacasa, Contreras *et al.* 1996).

Comments: The holotype of this species (not examined) is in the Haliday Collection, National Museum of Ireland, Dublin, Ireland (Graham 1963); it is unfortunate that it was chosen by the author as a primary type because it has a very vague, insufficient label data (it would have made much more sense if the current paratype specimen were used in such capacity).

Lacasa, Sánchez & Lorca (1996) reported *C. lepidotus* from Spain but were obviously confused about pertinence of their specimens to a particular sex: they claimed that only females of this species were found; however, they keyed (and also illustrated) apparently a male, which has a 3-segmented clava, whereas that of female is 2-segmented, as normal for *Ceranisus*.

Ceranisus hoddlei S. Triapitsyn & Morse, 2005

Ceranisus hoddlei S. Triapitsyn & Morse, 2005: 77, 78, 84, 85. (Type locality: San Francisco, Estado de México, Mexico)

Diagnosis: Among the species of *Ceranisus* in the New World, female and male of *C. hoddlei* are most similar to those of *C. loomansi* but the forewing in *C. hoddlei* is notably wider (about 2.4 x as long as wide) and more setose than in any other known species from the *pacuvius* group. For the detailed description and illustrations of both sexes of this species see Triapitsyn and Morse (2005).

Material examined: Holotype female [CNCI] and female and male paratypes in CNCI, UCRC and other collections (Triapitsyn & Morse 2005).

Distribution: Costa Rica, Honduras, Mexico, and Venezuela (Triapitsyn & Morse 2005).

Hosts: Unknown.

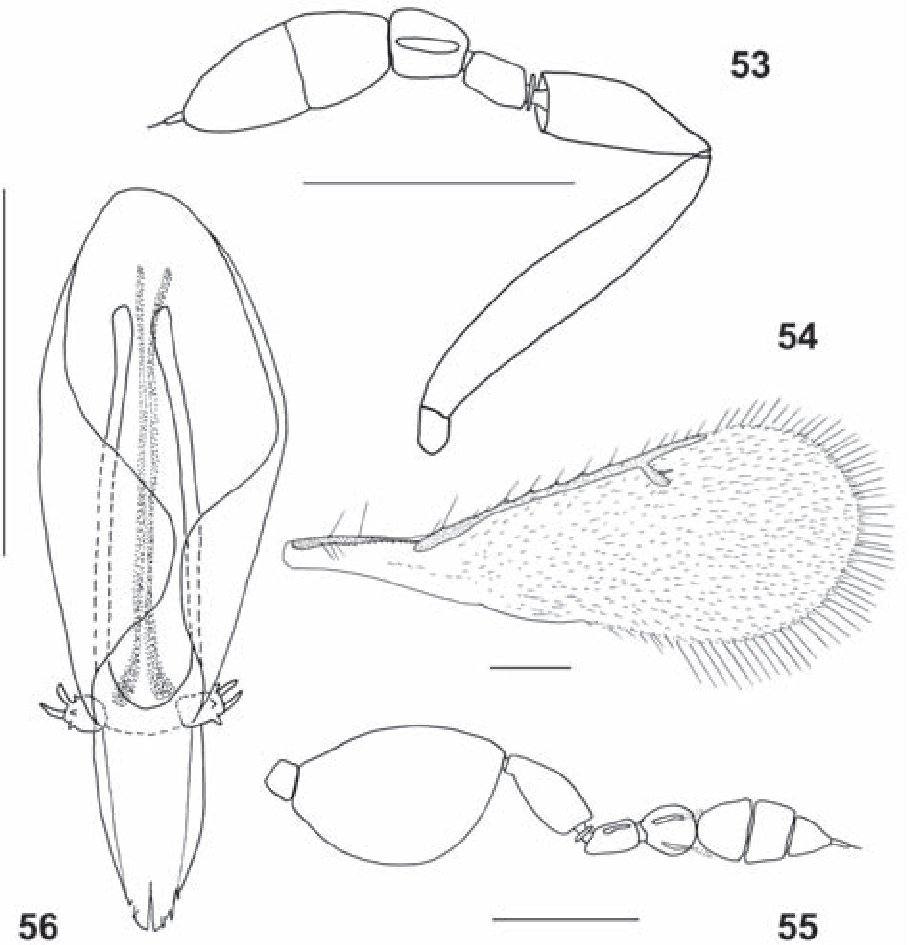
Ceranisus pacuvius (Walker, 1838)

Figs 53–56

Cirrospilus Pacuvius Walker, 1838: 383. (Type locality: near London, England, UK)
Entedon acestor Walker, 1839: 21. Synonymised under *C. pacuvius* by Boucek & Askew 1968: 137.
Ceranisus Pacuvius (Walker): Walker 1841: vi + pl. N, figs 2 and 2a.
Diglyphus aculeo Walker, 1848: 236. **Syn. n.** (was synonymised previously under *C. menes* by Boucek & Askew 1968: 137).
Derostenus clavicornis Thomson, 1878: 273. Synonymised under *C. menes* by Boucek & Askew 1968: 137 and under *C. pacuvius* by Boucek & Graham 1978: 232.
Asecodes aculeo (Walker): Dalla Torre 1898: 46.
Ganahlia clavicornis (Thomson): Dalla Torre 1898: 50.
Aleurodiphagus clavicornis (Thomson): Nowicki 1929: 155.
Thripoctenus kutteri Ferrière, 1936: 637–639. Synonymised under *C. pacuvius* by Boucek 1961: 26.
Thripoctenus kutteri Ferrière: Kutter 1936: 640–651.
Euderomphale clavicornis (Thomson): Erdös 1956: 25.
Ceranisus pacuvius (Walker): Bakkendorf 1957: 1–8; Graham 1959: 203; 1963: 203; Boucek 1961: 26; Boucek & Askew 1968: 137, 138; Trjapitzin 1978: 426; Loomans & van Lenteren 1995: 115–119, 196; Thuróczy & Jenser 1996: 151–153.

Diagnosis: This species was redescribed and illustrated in detail by Bakkendorf (1957). Therefore, only a brief diagnosis is given here.

Female. Body dark brown to black (basal 1/4 of gaster sometimes a little lighter but at least brown), appendages light brown to brown. Antenna (Fig. 53) with scape 4–5 x as long as wide; F1 notably longer than wide, usually with 1 sensillum but sometimes without sensilla, F2 wider than F1, with 1 or 2 sensilla; basal segment of clava slightly shorter than distal claval segment. Forewing (Fig. 54) about 2.8 x as long as wide; longest marginal setae about 3/10 maximal width of forewing; disc with numerous short setae, more or less uniformly setose beyond base of marginal vein. Ovipositor occupying about 3/5 length of gaster, not exserted.



Figs 53–56. *Ceranisus pacuvius* (Southampton, England, UK): (53) female antenna, (54) female forewing, (55) male antenna, (56) male genitalia. Scale lines = 0.1 mm.

Male. Similar to female except for normal sexually dimorphic features and darker colouration of body and appendages. Antenna (Fig. 55) with scape strongly dilated, almost smooth, 1.4–1.7 x as long as wide; funicle as in female, F1 with 1 sensillum, F2 with 2–3 sensilla; clava longer than funicle, about 2.0 x as long as wide. Genitalia as in Fig. 56.

Material examined: Lectotype male of *C. pacuvius* on card [BMNH], labelled: 1. "*Pacuvius*"; 2. "Lectotype"; 3. "LT♂ *Ceranisus pacuvius* (Walk.) det. Z. Boucek 1980"; 4. "B. M. Type Hym 5.2711".

Lectotype female of *E. acestor* on card [BMNH], labelled: 1. "Lectotype"; 2. "4^{38}5"; 3. "*Entedon acestor* Walker"; 4. "B. M. Type Hym 5.2712".

Lectotype female of *D. aculeo* on card [BMNH], labelled: 1. "*Diglyp. aculeo* W.48 Lectotype♀ M. de V. Graham det. 1974"; 2. "B. M. Type Hym 5.2711"; 3. "Lectotype"; 4. "Lectotype"; 5. "*Aculeo*". Also examined were 2 female paralectotypes [BMNH], labelled as "*aculeo*".

Lectotype female of *T. kutteri*, here designated to avoid confusion about the identity of this species, on slide labelled: 1. "SUISSE Flawil - 1935 H. Kutter Ex *Kakothrips robustus* ds. pois"; 2. "Tetrastichinae: *Thripoctenus kutteri*♀ Ch. Ferriere ["det." -crossed out] cotype."; 3. "*Thripoctenus kutteri* Ferrière LECTOTYPE♀ Des. by S. V. Triapitsyn 2000"; 4. "*Ceranisus pacuvius* (Walker) Det. S. V. Triapitsyn

2000" [BMNH]. Paralectotypes of *Thripoctenus kutteri* Ferrière, here designated: 1♀ on slide as well as 2♀ and 1♂ on a separate slide, same label data as the lectotype [BMNH].

Other material examined: GREAT BRITAIN: *Berkshire*: Berkshire Downs (nr Streatley): 14.vi.1975, J.S. Noyes, 7♂; 30.vi.1975, J.S. Noyes, 7♂. *Hampshire*: Southampton: 25.v.1977, L.A. Mound, 2♀ ("ex. *Sarothamnus scoparius*"); vi.1977, L.A. Mound, 2♂ [BMNH]. HUNGARY: Bükk, 7.vii.1959, J. Erdös, 1♂ (det. G. Szelényi). Kalocsa, 1.vi.1945, J. Erdös, 1♀ (on *Picea excelsa*, det. G. Szelényi). Mecsek, 19.v.1949, J. Erdös, 1♂. Ohat, 24.iv.1975, Hámoriné, 1♂ (det. G. Szelényi). Tompa, 9.v.1949, J. Erdös, 1♂ [HNHM]. Also all the specimens reported by Thuróczy & Jenser (1996) (det. C. Thuróczy) [SPLK].

Distribution: Europe (Loomans & van Lenteren 1995; Teulon *et al.* 1996). Following Boucek (1961), Trjapitzin (1978) reported this species from Moldova but at least specimens in ZIN actually belong to *C. planitianus*.

Hosts: See Loomans and van Lenteren (1995).

Comments: Examination of the lectotype of *Diglyphus aculeo* Walker (in BMNH) revealed that it belongs to *C. pacuvius* rather than to *C. menes*.

Ceranisus loomansi S. Triapitsyn & Headrick, 1995

Ceranisus loomansi Triapitsyn & Headrick, 1995: 237, 238, 246. (Type locality: Oak Creek Canyon near Flagstaff, Arizona, USA)
Ceranisus loomansi Triapitsyn & Headrick: Triapitsyn & Morse 2005: 76, 77, 83.

Diagnosis: Male and female: see Triapitsyn and Headrick (1995). This species is most similar to the Palaearctic species *C. pacuvius* and *C. antalyacus* and also to the Neotropical *C. nigrifemora*. *C. loomansi* can be most easily distinguished from *C. pacuvius* by the shape of the antennal scape in individuals of both sexes. The female scape is relatively shorter in *C. pacuvius* (length/width ratio 4–5:1) and longer in *C. loomansi* (length/width ratio about 7:1). Length/width ratio of the scape in male *C. pacuvius* is considerably less (1.4–1.7:1) than in *C. loomansi* (about 2.1:1). Female of *C. loomansi* also differs from that of *C. nigrifemora* in body colouration by being more or less uniformly black or dark brown; parts of antennae and legs as well as base of gaster are yellow to light brown in female of *C. nigrifemora*.

Material examined. Holotype female in USNM and paratypes in UCRC (Triapitsyn & Headrick 1995).

Distribution: Canada (Triapitsyn & Morse 2005) and USA.

Hosts: Found in association with *Scirtothrips citri* (Moulton) (Triapitsyn & Morse 1999).

Ceranisus sp. 1

(Not included in the key)

Figs 57, 58

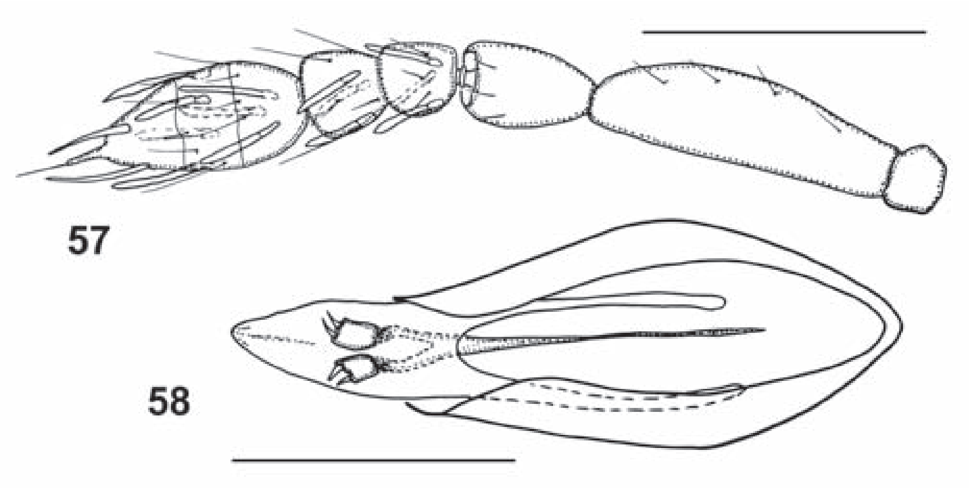
Diagnosis: Female. Unknown.

Male. Body dark brown to black, appendages slightly lighter. Antenna (Fig. 57) with a slender scape and a rather compact flagellum. Disc of forewing hyaline. Genitalia (Fig. 58) typical for the *pacuvius* species group but unusually large.

In habitus, this male resembles female of *C. femoratus*, for which no male is known, so one could only guess about their possible conspecificity. The antennal scape in this male is not swollen.

Material examined: JAPAN: *Fukuoka Pref.* (Kyushu Island): Mt Tachibanayama, 12.viii.1980, C.M. Yoshimoto, 1♂ [CNCI].

Hosts: Unknown.



Figs 57, 58. *Ceranisus* sp. 1, male (Mt Tachibanayama, Kyushu Island, Japan): (57) antenna, (58) genitalia. Scale lines = 0.1 mm.

Ceranisus sp. 2

(Not included in the key)

Diagnosis: Female. Unknown.

Male. Body and appendages dark brown to black. Antennal segments as follows: scape slender, F1 shorter than F2, clava rather long. Forewing densely setose including the area behind base of marginal vein; postmarginal vein very long, about as long as in *C. udnamtak* sp. n.; membrane slightly infuscated behind venation. Genitalia typical for the *pacuvius* species group.

It appears to be an undescribed species. The antennal scape in this male is not swollen, like in *Ceranisus* sp. 1.

Material examined: NEPAL: *Lalitpur District*: Phulchoki, 2600 m, 14.x.1983, A. Smetana, Löbl, 1♂ [CNCI].

Hosts: Unknown.

Species excluded from *Ceranisus*

Ceranisus ancylae (Girault, 1917) *in* Noyes 2002, mistakenly listed in *Ceranisus*

Thripoctenus ancylae Girault, 1917: Fullaway & Dobroscky 1933: 3439 (mistakenly listed in *Thripoctenus*).
Ceranisus ancylae (Girault): Noyes 2002.

Comments: Girault (1917*c*) described *ancylae* in the genus *Sympiesis* Förster, not in *Thripoctenus* as mistakenly indicated first by Fullaway and Dobroscky (1933) (Loomans & van Lenteren 1995) and more recently in *Ceranisus* by Noyes (2002).

Ceranisus nigricornis Motschulsky, 1863, **incertae sedis**

Ceranisus? *nigricornis* Motschulsky, 1863: 67. (Type locality: Mount Patannas (?an old name), Sri Lanka)

Material examined. 2 syntype females on cards [ZMUM]. First female, labelled: 1. "Type"; 2. "*Ceranisus nigricornis* Motsch. F of Ceyl. de Motsch.". Second female, labelled: 1. "?Synt."; 2. "*Ceranisus nigricornis* [Collection of Motschulsky (in Russian)]".

Distribution: Known only from the type locality in Sri Lanka.

Hosts: Unknown.

Comments: My examination of the syntypes revealed that this species for sure is not a *Ceranisus* but is rather placed in the eulophid subfamily Eulophinae.

Ceranisus semitestaceus Motschulsky, 1863, **incertae sedis**

Ceranisus? *semitestaceus* Motschulsky, 1863: 67. (Type locality: Nura-Ellia (Nuwara Eliya) Mountains, Sri Lanka)

Material examined. Holotype female [ZMUM] on card (an antenna mounted separately on a micro-slide imbedded in the second card on the same pin), labelled: 1. "*Ceranisus semiluteus* Motsch. F of Ceylon H + R. E."; 2. "*C. semiluteus* Motsch. (antennae types)"; 3. " sf. Tetrastichinae [V.A. Trjapitzin det. VI.1999 (in Russian, in handwriting of E.Ya. Shouvakhina)]".

Distribution: Known only from the type locality in Sri Lanka.

Hosts: Unknown.

Comments: Examination of the holotype confirmed the earlier identification by Prof. V.A. Trjapitzin (at my request) that this species for sure is not a *Ceranisus* but belongs in the eulophid subfamily Tetrastichinae. It is labelled as "*Ceranisus semiluteus*", which is likely a manuscript name used by V. de Motschulsky prior to naming it as *C. semitestaceus* in the original description (Motschulsky 1863).

Genus *Thripobius* Ferrière, 1938

Thripobius Ferrière, 1938: 146. Type species: *Thripobius hirticornis* Ferrière, 1938, by monotypy.
Thripobius Ferrière: Boucek 1988: 734; Schauff 1991: 70, 71; Loomans & van Lenteren 1995: 132–137, 197.

Diagnosis: Body size small to moderately small (0.5–1.0 mm); head and mesosoma smooth or weakly sculptured; complete and straight suture present across vertex just behind posterior ocelli; malar sulcus split ventrally (Y-shaped); antennal flagellum (in both sexes) with 2 funicle segments (usually appressed to each other) and a 3-segmented clava with an apical spicula (division between second and third claval segments often indistinct), flagellar segments with long sensilla and setae; notauli indistinct; midlobe of mesoscutum usually with 1 pair of setae but asetose in the type species of the genus; anterior margin of scutellum almost straight or slightly sinuate; forewing with bare area at posterior margin behind base of marginal vein, demarcated anteriorly by a sinuate line of setae; petiole wider than long. Other distinguishing features indicated at http://cache.ucr.edu/~heraty/Eulophidae/index.html (Burks 2003): "Frontal grooves extending to top of eye, sometimes ending in vertex[al] suture… Flagellum with elongate (type 3) peg sensilla". Because I could not see the frontal grooves in all the species of this genus except for *T. javae* (Girault) (due to the poor condition of the specimens), I don't use this character in the key to separate *Thripobius* from *Ceranisus*, in which the frontal grooves reach the eye at level of the anterior ocellus.

Hosts: Larval parasitoids of various Panchaetothripinae (Terebrantia: Thripidae).

Comments: In the future, the status of *Thripobius* may need to be downgraded to a species group within *Ceranisus* (in that case perhaps informally called as the *C. javae* species group), because most of the morphological characters used by various authors for its definition can also be found in some species of *Ceranisus*. For instance, the female clava is 3-segmented in *C. russelli* and most of its specimens have just one pair of setae on the midlobe of mesoscutum. At least one species of *Ceranisus* also has a split malar sulcus (Triapitsyn & Morse 2005); that was one of the main distinguishing features used by Schauff (1991) in the definition of *Thripobius*. The forewing in *Thripobius* spp. is very similar to that in the *menes* species group of *Ceranisus*. Because of the lack of good quality specimens of *Thripobius* species for study (particularly of *T. hirticornis*, the type species of the genus) and unavailability of molecular data on either *Thripobius* and *Ceranisus*, this problem remains unsolved for the time being.

Key to the species of *Thripobius*, females

1 Body entirely pale yellow .... **melikai** sp. n.
– Body black and yellow 2

2(1) F1 and F2 each notably longer than wide (in lateral view); forewing with a small dark cloud behind apex of stigmal vein .... *hirticornis* Ferrière
– F1 about as long as wide and F2 slightly wider than long (in lateral view); forewing hyaline behind apex of stigmal vein 3

3(2) Longest marginal setae on forewing about 1/2 maximal forewing width .... *javae* (Girault) **comb. n.**
– Longest marginal setae on forewing about equal to maximal forewing width .... *T.* sp.

Thripobius melikai sp. n.

Figs 59, 60

Etymology: This species is named after the collector, Dr George Melika.

Diagnosis: This species is smaller in size than the other three known species of *Thripobius* and can be easily distinguished from those by the predominantly pale yellow colour of the body. Also in *T. melikai*, F1 notably longer than F2 whereas these funicle segments are subequal in *T. javae*; in both species and also in *T.* sp. F1 and F2 are relatively tightly appressed (not appressed in *T. hirticornis*).

Description: Female (holotype and paratype). Body pale yellow, appendages pale.

Antenna (Fig. 59) with scape slender; F1 longer than wide and longer than F2, F2 subquadrate; division between second and third claval segments indistinct.

Mesosoma a little shorter than metasoma, smooth. Forewing (Fig. 60) 3.0–3.1 x as long as wide; longest marginal setae about 3/4 maximum forewing width; disc hyaline and with about 8 irregular rows of setae in the broadest part (beyond venation). Hind wing 8–9 x as long as wide.

Ovipositor very short, occupying a little more than 1/3 length of gaster, barely exserted beyond its apex.

Measurements (n=1, paratype on slide). Body: 609. Antenna: scape: 91; pedicel: 39; F1: 21; F2: 15; clava: 79. Forewing: 455/149; longest marginal seta: 109. Hind wing: 366/43. Ovipositor: 97.

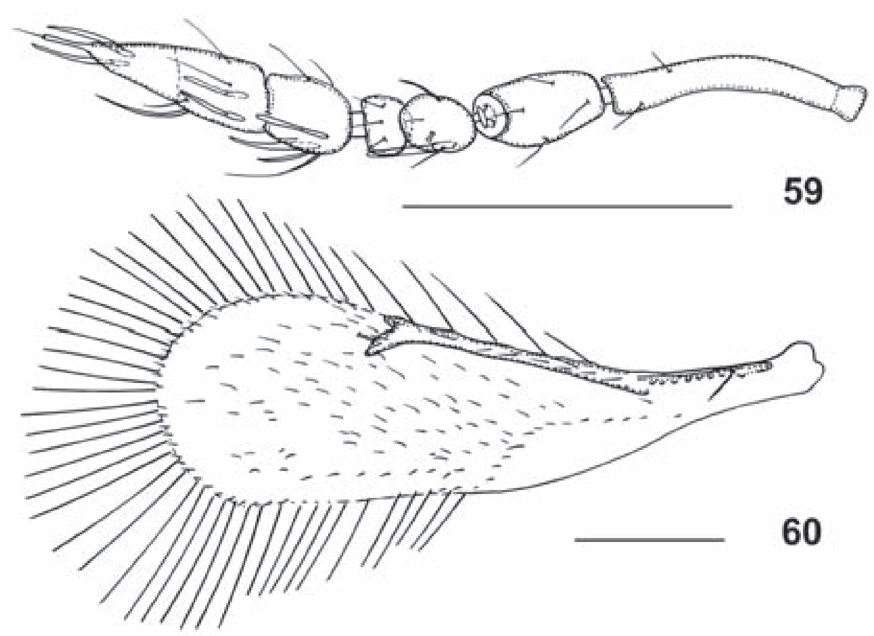
Male. Unknown.

Holotype: Female on point, labelled: 1. "CHINA: Beijing Province, Mentougou District, 130 km NW Beijing, Xiaolongmen Sta., 39°59.220'N:115°31.479'E, 1095 m, 28.vii.2002, G. Melika. Mounted at UCR/ERM by V.V. Berezovskiy 2004 in Canada balsam"; 2. (red) "*Thripobius melikai* S. Triapitsyn HOLOTYPE ♀" [UCRC].

Paratype: Same data as the holotype, 1♀ on slide [UCRC].

Distribution: Known only from the type locality in China.

Hosts: Unknown.



Figs 59, 60. *Thripobius melikai* sp. n., female (paratype): (59) antenna, (60) forewing. Scale lines = 0.1 mm.

Thripobius hirticornis Ferrière, 1938

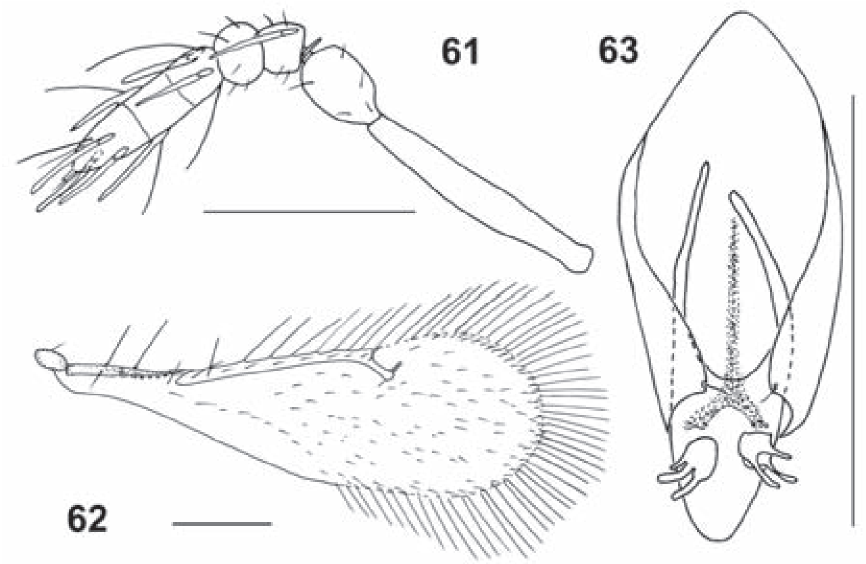
Thripobius hirticornis Ferrière, 1938: 146, 147. (Type locality: Usa, Northern Province, Tanzania)
Thripobius hirticornis Ferrière: Loomans & van Lenteren 1995: 132–137, 197.

Diagnosis: The original description and illustrations are adequate for easy recognition of this biparental species. This is the largest species among *Thripobius* spp. (body length of the lectotype almost 1.0 mm). Antenna with F1 and F2 markedly longer than broad in both sexes; female flagellar segments with several (at least 4 on each of funicle segments) very long sensilla and setae sticking out far beyond the segment bearing them, distal claval segment with a very short apical spicula; setae on male flagellum longer than on female's. Body mostly dark brown in both sexes, gaster yellow basally and dark brown distally (its entire posterior half); midlobe of mesoscutum without setae; forewing disc with a small dark cloud below tip of stigmal vein.

Material examined: Lectotype female on slide (BMNH), here designated to avoid possible confusion regarding the status of the type specimens of this species, labelled as follows: 1. "AFRICA Tanganyika, N. Prov. Usa, 20.xii.1931 A. H. Ritchie Ex *Retithrips aegyptiacus*."; 2. "Tetrastichinae: *Thripobius hirticornis* cotypes. Ch. Ferriere ["det." - crossed out] 7♀ 2♂"; 3. "LECTOTYPE♀ (circled) Des. S. Triapitsyn 2004". The lectotype (a large female, the middle specimen in the bottom row) is uncleared, mounted under the same coverslip with 8 other original syntype specimens. Paralectotypes, here designated (BMNH): 8 specimens mentioned above (6♀ , 2♂); 5 females, 4 males on a separate slide, with same labels; also parts of several paralectotypes (apparently of 6 females) on a slide labelled: "W. AFRICA Gold Coast, Adeiso, E. P., IV.1935 G. S. Cotterell Ex *Retithrips syriacus*. 860."; 2. "Tetrastichinae: *Thripobius hirticornis* Ch. Ferriere ["det." - crossed out] cotypes.". All specimens in BMNH.

Distribution: Ghana, Kenya, Tanzania, Uganda, and Zimbabwe (Loomans & van Lenteren 1995).

Hosts: See Loomans and van Lenteren (1995).



Figs 61–63. *Thripobius javae*: (61, 62) female (Riverside, California, USA): (61) antenna, (62) forewing; (63) male genitalia (paratype of *Thripoctenus maculatus*). Scale lines = 0.1 mm.

Thripobius javae (Girault, 1917), **comb. n.**

Figs 61–63

Epomphale javae Girault, 1917*b*: 1. (Type locality: Salatiga, Java Island, Indonesia)
Thripoctenus maculatus Waterston, 1930: 243. **Syn. n.**
Thripobius semiluteus Boucek, 1976: 412, 413. **Syn. n.**
Ceranisus maculatus (Waterston): Husain & Khan 1986: 212; Loomans & van Lenteren 1995: 127–129, 196.
Thripobius semiluteus Boucek: Boucek 1988: 734; Loomans & van Lenteren 1995: 132–137, 197.
Ceranisus javae (Girault): Loomans & van Lenteren 1995: 132, 196; Noyes 2002.

Diagnosis: Female. Well described and illustrated by Boucek (1976) (as *T. semiluteus*). Antenna and forewing as in Figs 61 and 62, respectively.

Male. Similar to female except for normal sexually dimorphic features such as genitalia (Fig. 63). Quite rare.

Type material examined: Lectotype female of *E. javae* on slide (USNM), here designated to avoid possible confusion regarding the status of the type specimens of this species, labelled as follows: 1. " [red] "*Epomphale javae* Gir. Type No. 20619 U.S.N.M"; 2. "*Epomphale javae* Girault ♀ LECTOTYPE (circled) Des. S. Triapitsyn 2004"; 3. "+ 2♀ PARALECTOTYPES + heads (paralectotype) = *Thripobius javae* (Girault) Det. S. Triapitsyn". The lectotype specimen is complete but uncleared, mounted laterally under the same coverslip with 2 other original syntype specimens. Paralectotypes, here designated: 2 females mentioned above, on the same slide with the lectotype; 4 females (some of them incomplete) on one point (USNM), originally labelled: 1. (red) " 20619"; 2. "*Epomphale javae* Gir. ♀ Types"; 14 females on one slide (USNM), originally labelled: " *Epomphale javae* Gir. ♀ paratypes".

Allotype male of *T. maculatus* [BMNH], dissected to many parts, on slide labelled: 1. "Allotype. *Thripoctenus maculatus* Waterst. ♂."; 2."ex. Vine Thrips. India, Lyallur, Punjab. Botanical Gdns. 15.xi.29. 1930-18. M. Afzail Husain". Other paratypes of *T. maculates* [BMNH] (examined): 5 females and 2 males on 4 slides, all dissected to many parts (some incomplete or broken), same data as the allotype.

Paratypes of *T. semiluteus* [BMNH], labelled: "India, Bangalore - Hebbal, ex. *Heliothrips* on *Croton*, I.1971, CIBC No. 29 CIE A4631", 1♀; "AFRICA, São Tomé, ex. *Brachyurothrips anomalus* on *Hibiscus* 5.ii.1975, J. Derron", 2♀.

Other material examined: AUSTRALIA: *New South Wales*: Mudgee, Victoria Park, 13.iv.1994, S. Goodwin, M. Steiner, 2♀ ("Assoc. with *Heliothrips haemorrhoidalis* on *Viburnum*"). *Northern Territory*: Darwin, 17.ix.1994, M. Steiner, S. Goodwin, 2♀ ("Assoc. with thrips on mango") [ANIC]. *Queensland*: Kingfisher Park, 1 km N Julatten, 16°36'S:145°20'E, 18.xi.1997, C.J. Burwell, 1♀ [QMBA]. Pechey, 6.v.1941, A.R. Brimblecomb, 18♀ ("Par. *Heliothrips haemorrhoidalis*"). INDIA: *Karnataka*: Bangalore, xii.1955, 3♀ ("Scale on *Croton* C. S. No. 168") [USNM]. USA: *California*: Riverside Co., Riverside: UCR Lab. culture on *H. haemorrhoidalis* (28♀ coll. 5.viii.1986 and 24♀ coll. 19.x.1988) of Australia, New South Wales, origin, orig. coll. by G.A.C. Beattie 28.vii.1986, likely at Somersby [UCRC]. UCR Quarantine culture on *H. haemorrhoidalis* of Bahamas origin, 3♀ [CNCI, UCRC]. UCR Lab. culture on *H. haemorrhoidalis* (coll. 19.x.1988) of Brazil, Minas Gerais, Lavras, origin, orig. reared by J.A. McMurtry 12.v.1988 from *Heliothrips* sp., 9♀ (Det. J. LaSalle, 1989 as *T. semiluteus*) [UCRC]. UCR Lab. culture on *H. haemorrhoidalis*, 23.x.1989, 9♀ [CNCI, UCRC].

Distribution: Apparently native and widespread in the Oriental and Australasian regions (except for the temperate zones) and also possibly in the Afrotropical region; introduced into some countries including the New World (LaSalle & McMurtry 1989; McMurtry *et al.* 1991; Loomans & van Lenteren 1995; Kuslitzky 2003).

Hosts: Various Panchaetothripinae (Thripidae), as listed by Loomans and van Lenteren (1995) for *T. semiluteus* and *C. maculatus*.

Comments: As correctly predicted by Loomans and van Lenteren (1995), *C. javae, C. maculatus* and *T. semiluteus* turned out to belong to the same species, based on examination of their type specimens; hence the above synonymies under the earliest described species, *T. javae*.

Thripobius sp.

Diagnosis: This appears to be a good new species resembling *T. javae* in most morphological features except for the forewing, which has a much longer marginal setae relative to the wing's width. Its metasoma has one orange dorsal spot, rather than 2-4 dark brown spots on the subapical terga (typical for *T. javae*).

Material examined: CHINA: *Beijing Province*: Mentougou District, 130 km NW Beijing, Xiaolongmen Sta., 39°59.220'N:115°31.479'E, 1095 m, 28.vii.2002, G. Melika, 1♀ [UCRC].

Distribution: Known only from a single female specimen from Beijing Province in China.

Hosts: Unknown.

Comments: I am reluctant to describe a new species based on a single specimen just in case it could be an aberrant individual of *T. javae*.

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